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ABSTRACT

The Junior High School Mathematics Consortium was a project in cooperative curriculum development involving 20 Alberta, Canada school systems. The project materials were developed and revised according to performance objectives developed by the Edmonton Public School Board, and the program unit booklets were developed cooperatively by ten school systems. The purpose of the evaluation project was to evaluate the mathematical appropriateness of the Junior High Mathematics Program course objectives, and the suitability of the support materials in assisting teachers in reaching these objectives. Data were collected through examinations, interviews, and questionnaires administered to 37 volunteer pilot schools throughout the consortium member systems. The results indicated that the course objectives were mathematically appropriate and that the support materials were suitable for the designed purposes. It was recommended that the program should be authorized by the Alberta Department of Education; but that further study should be made of the program's suitability for slow learners, and that the additional components in the revised program (laboratories, transparency masters, applications, history, basic skills supplement) should be evaluated. (Author/BW)

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SUMMARY REPORT
OF THE
"IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS (JUNIOR HIGH MATHEMATICS CONSORTIUM)" PROJECT

FUNDED BY THE PLANNING AND RESEARCH BRANCH
ALBERTA EDUCATION

FEBRUARY, 1977

R. Rideout
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M. Pawluk
T. Blowers

TM007 049

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PART II - EVALUATION REPORT

1. PROJECT TITLE

Implementation and Revision of Junior High Mathematics Curriculum Materials (Junior High Mathematics Consortium)

2. PROJECT ABSTRACT

The Junior High School Mathematics Consortium was a project in co-operative curriculum development involving twenty Alberta school systems.

Partial funding for the two-year project was provided by Alberta Education, with the balance being contributed by the respective member systems. The design of the project included the preparation of teacher support materials as well as student materials for each grade level (seven, eight and nine). The project was successful in that all of the objectives as outlined in the contract (Appendix A) have been met.

3. PROJECT BACKGROUND AND STATEMENT OF THE PROBLEM

A review of the mathematics curriculum over the past years indicated that textbooks had been, to a large extent, the determiners of curriculum content. Educational practice, maintained on the basis of tradition, has been to authorize one or more texts for the instruction of mathematics at the various grade levels. This practice, for a number of reasons, has often been inadequate in meeting the curriculum needs of both students and teachers. Due to the inadequacy of these texts to provide for the Alberta curriculum as set by the provincial course of studies, school systems have been forced to seek additional resources in order to provide a complete program for their students. The practice of developing curriculum on a local basis, to correct the inadequacies in the authorized texts, can be inefficient and unsatisfactory because of the duplication of effort and, in many of the smaller systems, the lack of human and material resources. To date several school districts have experimented with co-operative curriculum development and have found this to be a viable alternative. A resolution passed

3. PROJECT BACKGROUND AND STATEMENT OF THE PROBLEM (Cont'd.)

during the 1974 "Curriculum Decision-Making in Alberta" conference, in Red Deer, stated, "It is recommended that the Department of Education support the idea of shared responsibility in curriculum decision-making by helping to provide the necessary resources (such as time, money, and expertise) to facilitate local curriculum development activities."

In response to this recommendation the Edmonton Public School Board, in co-operation with nineteen other school systems, initiated a proposal to the Department of Education for the necessary funds to carry out "The Implementation and Revision of the Junior High Mathematics Curriculum Materials". This project "The Junior High Mathematics Consortium" was to carry out the co-ordinated development revision, field-testing and dissemination of locally developed curriculum materials among co-operating school systems to ensure the most effective use of both human and material resources.

The development and revision of the project materials was based on two previously developed components:

a) The Performance Objectives
These were developed by the Edmonton Public School Board through projects funded by the Department of Research and Evaluation.

b) The Program Unit Booklets
These were also developed through Edmonton Public School Board research projects in co-operation with an informal consortium of the following school systems:

(i) Edmonton Separate School District #7
(ii) County of Leduc #25
(iii) County of Parkland #31
(iv) St. Albert P.S.S.D. #6
(v) County of Strathcona #20
(vi) Calgary R.C.S.S.D. #1
(vii) Red Deer Public School District #104
(viii) Fort McMurray R.C.S.S.D. #32
(ix) County of St. Paul #19

4. PROJECT DIRECTOR

Richard L. Rideout

5. PROJECT LOCATION (CONSORTIUM MEMBER SYSTEMS)

1. Edmonton Public School District #7 (Co-ordinating Member) Woodcroft Resource Centre
2. Edmonton Separate School District #7
3. County of Leduc #25
4. County of Parkland #31
5. St. Albert Protestant Separate School District #6
6. County of Strathcona #20
7. Calgary School District #19
8. Calgary Roman Catholic Separate School District #1
9. Foothills School Division #38
10. County of Vulcan #2
11. County of Ponoka #3
12. Red Deer School District #104
13. Red Deer Roman Catholic Separate School District #17
14. Mountain View County #17
15. Falher Consolidated School District #69
16. Fort McMurray Roman Catholic Separate School District #32
17. Bonnyville School Division #46
18. County of Beaver #9
19. County of St. Paul #19
20. St. Paul School District #2228

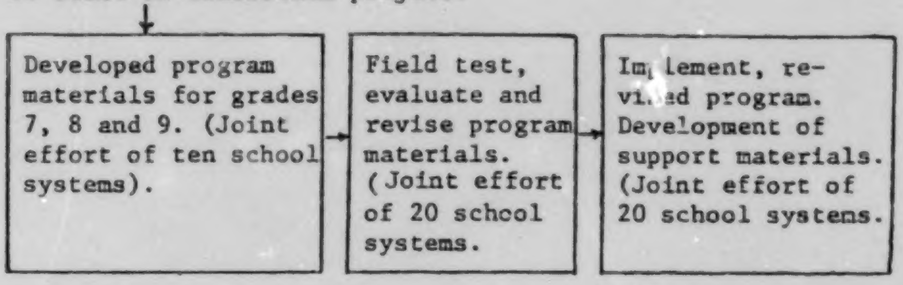
6. PROJECT DURATION

January 6, 1975 to December 31, 1976

7. OBJECTIVES OF THE PROJECT

A. Terminal Objectives

Grades 7, 8, and 9 mathematics objectives developed prior to start of consortium project.


Developed program materials for grades 7, 8 and 9. (Joint effort of ten school systems).
Field test, evaluate and revise program materials. (Joint effort of 20 school systems.
Implement, revised program. Development of support materials. (Joint effort of 20 school systems.

B. Enabling Objectives

(i) To field test, evaluate and revise the set of existing unit booklets which provide support materials for the instruction of mathematics. These unit books provide (a) references to texts presently used by the system; (b) activities which may be used to reinforce the objectives; (c) suggested developments and exercises for each objective. The development of the objectives is not intended as a teacher reference and not as material for student self-study.

(ii) To evaluate the Junior High School Mathematics course objectives with respect to their mathematical appropriateness.

(iii) To develop a bank of valid and reliable test items which teachers can use to monitor student achievement.

(iv) To write a teacher handbook which contains: (a) notes on the components of the program; (b) some suggestions for the utilization of program booklets; (c) a complete set of level 7, 8, and 9 objectives to serve as a reference for the teachers for the skills and concepts covered by the students; and (d) a program management system to facilitate the upkeep of student profiles and records of student achievement.

7. OBJECTIVES OF THE PROJECT (Cont'd.)

B. (v) To provide supplementary materials for special purposes such as remediation, audio-visual references and transparency masters.

(vi) To provide inservices to aid teachers in utilizing the different teaching modes and varied instructional materials in their instruction of mathematics.

8. DESIGN OF THE PROJECT

A. Organization

This project required an organizational structure which provided for the co-ordination of efforts, adequate communication and the dissemination of co-operatively produced project materials among twenty school systems. During the project the feasibility of using a project co-ordinator, system representatives and local curriculum committees has proven to be an effective way of accomplishing this task.

1. Zones

The member systems of the Consortium were organized by zones, on a geographical basis to facilitate the development of the assignments as outlined in the objectives of the project. The membership and the assignment for each zone is outlined on the following page.

8. DESIGN OF PROJECT (Cont'd.)

ZONE	MEMBER SYSTEMS	ASSIGNEMENT
Greater Edmonton Zone	Edmonton Public Edmonton Separate County of Leduc #25 County of Parkland #31 St. Albert P.S.S.D. #6 County of Strathcona #20	General Unit Revision Editing Quality Control
South Zone	Calgary S.D. #19 Calgary R.C.S.S.D. #1 Foothills S. D. #38 County of Vulcan #2	Test item bank: -multiple choice items -open ended items Normed Survey Test
Central Zone	County of Ponoka #3 Red Deer S.D. #104 Red Deer R.C.S.S.D. #17 Mountain View County #17	Mathematics Labs Audio Visual Reference Guide
North Zone	Falher Consolidated S.D. #69 Fort McMurray R.C.S.S.D. #32	Transparencies
East Zone	Bonnyville S.D. #46 County of Beaver #9 County of St. Paul #19 St. Paul S.D. #2228	Basic Skills Supplement

A. 2. Zone Assignments

(a) The Greater Edmonton Zone

The Greater Edmonton Zone had the responsibility for revising all the units throughout the program, for editing new material submitted from the other zones and for generally facilitating the production of a quality product.

In carrying out this task extensive use was made of both small and large committees. During the summer of 1975, twenty-five teachers from the six systems met for ten days in a comprehensive effort to revise the existing unit booklets.

8. DESIGN OF PROJECT (Cont'd.)

A. 2. Zone Assignments

(a) The Greater Edmonton Zone

Smaller committees met when necessary to edit the material submitted from the other zones. The work assignments for each of the zones were broken into stages with completion dates set for each stage. These completion dates were staggered for each zone to ensure a continuum of work for the revision committees and the project secretaries.

As a general practice all revision and editing committees were composed of representatives from the Edmonton Public School Board and at least one or two other systems, with the larger meetings having representatives from all the systems in the zone. Efforts were also made to keep the personnel on each committee as constant as possible. This practice increased the efficienty of the committees as members were familiar with the work being done. The expertise of the individuals concerned was also greatly enhanced through the continuous exposure to only one aspect of the program.

Keeping the revision committee personnel more or less static also reduced the possibility of continuous philosophy changes in the program. In this way, continuity in work expectation was preserved and the job of the curriculum writers was made easier.

(b) The South Zone

The South Zone had the responsibility of preparing test items referenced to the objectives of the program. These test items are of both an open-ended and multiple choice nature and are of the same format as those in the existing

8. DESIGN OF PROJECT (Cont'd.)

A. 2. Zone Assignments (Cont'd.)

(b) The South Zone

Edmonton Public School Board test item bank in use throughout the Consortium. The multiple choice items were field tested, computer analysed and then revised where necessary before inclusion in the test item bank. The open-ended items were also field tested and revised before inclusion in the test bank.

Although the preparation, analysis, revision and typing of the test items has been completed, the actual production of the test bank will be delayed until the spring of 1977. This delay has been necessitated by the field test cycle of the normed survey test also being produced by the South Zone. The items not used in the survey test will comprise the test bank and until the survey test is finalized the test item bank must be held in abeyance. In order to preserve the validity of the survey test, the items cannot be included in the test bank for general distribution among teachers. The survey test was field tested in semester schools in January of 1977. Necessary revisions will be made soon after, freeing the remaining test items for publication. The survey test in its final form will be normed in June of 1977 and a copy with all the necessary statistics distributed to each member of the Consortium by September, 1977.

This timeline was approved by the Consortium Executive even though the project officially ends as of December 31, 1976. Concensus within the executive was that the production of a quality product was more important than trying to meet the project deadline.

8. DESIGN OF PROJECT (Cont'd.)

A. 2. Zone Assignments

(c) The Central Zone

The Central Zone had the responsibility of preparing approximately two Mathematics Labs per unit for each unit in the program. These Mathematics Labs were designed as an alternative method of learning for the students and can be used in lieu of the teacher presenting a lesson. After exploring a manipulative path of activities the student makes observations and conclusions which lead him to attempt the regular unit exercises with little or no additional explanation from the teacher. The teacher's role is one of consultant or perhaps resource person to the student involved in the mathematics laboratory. The mathematics labs appear as an integral part of the Teachers' Resource Book at each level.

Part two of the Central Zone's assignment included the referencing of audio visual materials to the mathematics objectives. To complete this task teachers from the zone researched all available audio visual materials from local sources as well as all they could obtain from commercial publishers. The committee was successful as the referencing includes not only the objectives for which the material is suitable but also helpful comments for teachers as to the grade level, International System of Units (SI) content, length, and in some instances, general suggestions for use.

The audio visual references appear as a separate section in the teachers' booklet entitled, "Management and Audio-Visual Guide", and are indexed with the publishers' names and addresses.

(d) The North Zone

The North Zone was responsible for the preparation of creative transparency masters for use in the teachers' section of the project materials. These transparency masters are designed to be used as a second-day aid in teaching an objective. The teacher resource materials contain a more fundamental type of transparency master designed to be used in the initial teaching of the objective. The creative transparency master is of a type that could be used for discussion, review or reinforcement of previously taught material and will be used to complement the fundamental transparency in most instances.

The size of the zone and the amount of funding available has restricted the number of possible creative transparencies that could be produced. In consultation with the project co-ordinator the zone members directed their activities towards the objectives that readily lent themselves to the production of transparencies of this type.

(e) The East Zone

The East Zone had the responsibility of developing a Basic Skills Supplement. For each of the objectives identified as a basic core objective, the Basic Skills Supplement provides high interest exercises of the motivational, invoice and developmental types:

8. DESIGN OF PROJECT (Cont'd.)

A. 2. Zone Assignments (Cont'd.)

(e) The East Zone

(i) Motivational

These exercises reinforce the objective being taught by providing a joke, riddle, or picture, to be completed for information obtained in solving questions of the type required by the objective. Exercises of this type are of high interest to students.

(ii) Invoice

These exercises use an actual invoice from a local business as the base for a series of questions relating to the objective. The invoices are supplemented by pictorial advertisements of articles which appeal to junior high school students and provide for a practical but motivating form of learning.

(iii) Developmental

Exercises of this type are more repetitive in nature and allow for a gradual progression from easy to difficult. Reminder clouds of important concepts, along with numerous examples, are inserted, to help the student achieve the objective.

As the title implies, the Basic Skills Supplement is not intended as a complete program. Teachers are advised to supplement the regular program by substituting exercises where applicable. These exercises have been provided for approximately one-third of the objectives in the total program.

8. DESIGN OF PROJECT (Cont'd.)

A. 3. Personnel Involved in the Project

The involvement of personnel is as follows:

a) The Executive

The executive members were elected for the duration of the project. Their function was to set the policy and act as the decision-making body for the general consortium membership. The executive consisted of the chairman from the coordinating member system, the liaison representative from the Department of Education, the recording secretary, three representatives from the general membership, the official contact person between the coordinating member and the Department of Education and the project coordinator who acted as an executive secretary.

CONSORTIUM EXECUTIVE

Chairman	Mr. M. Pawluk	Supervisor of Mathematics, Edmonton Public School Board
Liaison Representative	Dr. L.R. Tolman	Associate Director of Curriculum, Alberta Education
Recording Secretary	Mr. J. Curilla	Supervisor of Instruction, St. Albert P.S.S.D. #6
Member	Mr. R. Macdonald	Assistant Superintendent County of Leduc #25
Member	Mr. R. D. Mackenzie	Mathematics Consultant Edmonton Public School Board
Member	Mr. M. Bye	Mathematics Supervisor Calgary Public School District
Contact Person	Dr. T. Blowers	Director of Research Edmonton Public School Board
Project Coordinator (Non-voting)	Mr. R.L. Rideout	Teacher Edmonton Public School Board

8. DESIGN OF PROJECT (Cont'd.)

A. 3. Personnel Involved in the Project

b) The Department of Education

The Department of Education has been involved in the project in that they have:

(i) provided advisory services to the consortium executive through Dr. Les Tolman, the liaison officer for the Department of Education.

(ii) provided some consultative services to the member systems through the services of Dr. Carol Chandler and Mr. John Wood.

(iii) provided liaison to the executive through the project coordinator and the Junior High Mathematics Ad Hoc Committee.

(iv) provided some legal advice to the Consortium in the preparation of an addition and amendment to the contract between the Department of Education and the Consortium. (Appendix B)

c) The Project Co-ordinator

Mr. Richard L. Rideout, the project co-ordinator, assumed the responsibility for the overall operation of the project. More specifically he was responsible for:

(i) implementing executive directives

(ii) scheduling the work timeline

(iii) organizing a quality control and editing committee

(iv) monitoring all expenditures and resources

(v) allocating release time for participating teachers

(vi) establishing communication channels and reporting project results

8. DESIGN OF PROJECT (Cont'd.)

A. 3. c) The Project Co-ordinator

(vii) establishing and co-ordinating the writing committees

(viii) establishing a field test, evaluation and review cycle

(ix) establishing procedures for working with external evaluations.

d) The System Administrators

The system administrators had the major responsibility of establishing project guidelines and provided the necessary support for the operation of curriculum committees in their respective systems. In addition, The Edmonton Public School Board had the responsibility, by contractual arrangement, to oversee the operation of the project and the work of the project co-ordinator. Dr. Tom Blowers, Director of Research, Edmonton Public School Board provided this service as well as being the official contact person between the Consortium and the Department of Education.

e) The System Representatives (Appendix C)

The system representatives were designated by each respective system for the purpose of maintaining close liaison with the project co-ordinator and local writing committees.

f) The Local Curriculum Committee

The local curriculum committee was formed by each system and carried out the tasks as outlined by the system administrator, system representative and project co-ordinator.

8. DESIGN OF PROJECT (Cont'd.)

A. 3. g) The Editing Committees

The primary responsibility of the editing committees was to perform an internal quality control function regarding the locally produced program materials. In addition, these committees maintained smooth sequencing and articulation between objectives and units.

h) The Evaluation Chairman

Mr. R.D. Mackenzie, the evaluation chairman, ensured that the evaluation was carried out according to the evaluation design and was responsible to the project co-ordinator.

i) The Evaluation Committee

Each of the pilot schools had one representative to administer the procedures required by the evaluation design. In addition, a separate committee summarized and analyzed the incoming data in preparation for the final evaluation report.

j) The Pilot Schools

The contact person along with other teachers in the pilot school contributed to the overall revision process by completing end of unit interviews after teaching each unit. This provided information to the editing committees which was used in the revision of each of the program units.

k) University

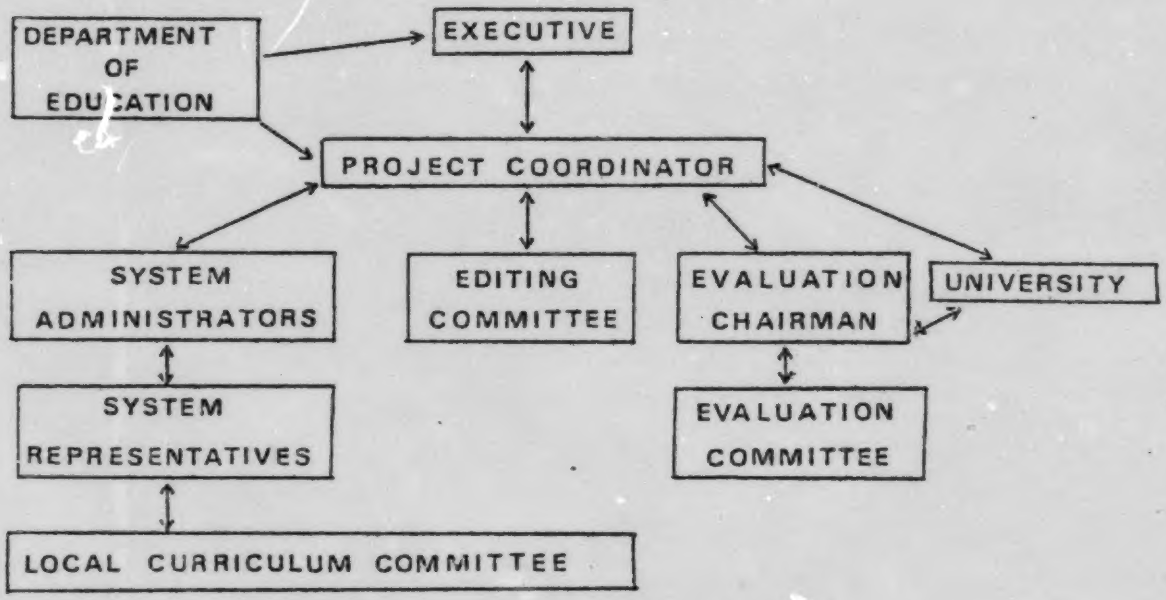
The university was used for resource personnel during the development of the project materials. In addition, some aspects of the evaluation procedures were handled by the university as they could provide an expert, unbiased view.

8. DESIGN OF PROJECT (Cont'd.)

A. 3.

The chart which follows illustrates the structure and communication routes of the Consortium as well as the personnel involved in the administration, development and operation of the project.

CONSORTIUM - STRUCTURE


DEPARTMENT OF EDUCATION
EXECUTIVE
PROJECT COORDINATOR
SYSTEM ADMINISTRATORS
EDITING COMMITTEE
EVALUATION CHAIRMAN
UNIVERSITY
SYSTEM REPRESENTATIVES
EVALUATION COMMITTEE
LOCAL CURRICULUM COMMITTEE

8. DESIGN OF PROJECT (Cont'd.)

B. Operation

1. The Initial Stages

a) The Project Co-ordinator

After the project proposal to the Department of Education was accepted the task of hiring a project co-ordinator was initiated. By previous agreement of a general meeting, the project co-ordinator was to be hired from the co-ordinating system.

Mr. Emery Dosdall, the original project director, selected three teachers from his system who were then interviewed by Mr. Dosdall, Mr. Bob McDonald, Assistant Superintendent of the County of Leduc #25 and Mr. John Curilla, Supervisor of Instruction, St. Albert P.S.S.D. #6. On the basis of these interviews, Mr. Richard L. Rideout was selected as the project co-ordinator.

b) The Letter of Commitment

One of the first duties of the project co-ordinator was to obtain and forward to the Department of Education, a letter of Commitment from the Chief Executive officer of each participating school system. (Page 5, Schedule A, Section B-a of the contract.) The letter of commitment indicated agreement to provide financial support, as pro-rated by the consortium, for the project.

8. DESIGN OF PROJECT (Cont'd.)

B. 1. c) The Board Motion

Closely following the letter of commitment was a duly passed board (or school committee) motion from each system indicating agreement to provide financial support as prorated by the Consortium for the project. These were forwarded to the Department of Education by Dr. T. Blowers, the contact person for the consortium.

2. The Planning Process

Prior to the government acceptance of the project proposal, the consortium members had been split into zones and a task had been allocated.

After the acceptance of the proposal the project co-ordinator met with the system administrators and/or the system representatives in a zone meeting to discuss the assignment. In consultation with the zone members, dates were set at which time certain agreed upon portions of the assignments would be submitted to the project co-ordinator for revision.

This process was repeated for each zone. The project co-ordinator made special efforts to stagger the due dates from the various zones to avoid a back log of work for the revision committees. Staggering the due dates also ensured a shorter return time for the material submitted and allowed virtually immediate feedback for the local curriculum committees.

8. DESIGN OF THE PROJECT (Cont'd.)

B. 2. This process also facilitated the budgeting of secretarial time for typing of the final master copy. In this manner a continuity of work was guaranteed and maximum use could be made of a limited resource.

When all submission dates had been agreed upon, the project co-ordinator drew up an overall project design to regulate the flow of work and the revision process. This design included time for the printing of the project materials to ensure distribution by the project deadline.

3. Meetings

a) General Meetings

Two general meetings of all the system representatives were held each year. These meetings gave each representative the opportunity to meet with the others and provide input to the general operation of the Consortium. The project co-ordinator provided a progress report so that each member could be kept up to date on the project. One general meeting included a report from the zones with specifics on the nature and progress of their respective zone assignments.

Attendance at these meetings was essentially obligatory with system representatives encouraged to send alternates if they could not attend. For this reason all expenses for these meetings, claimed for travel and subsistence, were reimbursed from the Department of Education funds.

8. DESIGN OF THE PROJECT (Cont'd.)

B. 3. b) Executive Meetings

Executive meetings were held as needed and averaged about five per year. These meetings determined the policy and general directions for the overall operation of the Consortium. With the exception of one member who had a considerable distance to travel, no expenses were reimbursed for these meetings.

c) Zone Meetings

Zone meetings were also held as needed and for most zones averaged about five each year. Most representatives found zone meetings very useful as they allowed system input on the co-operative task. Plans were made or changed, necessary revisions were explained and due dates were reviewed. In addition, common or specialized concerns were discussed and solutions sought. Some of these concerns were directed to the executive and others to the general meeting. In all cases where concerns affected other systems, the affected systems were allowed input and an opportunity to influence the decisions being made.

4. The Contract (Appendix A)

The contract between the Consortium and the Minister played a large role in the determination of operating procedures. The contract was very explicit about each system's commitment by requiring letters from the Chief Executive Officer and Board/School Committee motions showing support for the project.

8. DESIGN OF THE PROJECT (Cont'd.)

B. 4. Work expectations were clearly defined in the contract (as per the original proposal for the project) as were some of the legal rights and limitations for both parties.

Budgeting guides were provided in Schedule B and suggested that approximately 74% of the total funding should be spent on teacher release or contract time, 13% should be spent on evaluating the project, 7% on travel and subsistence for participating teachers, and 6% on contracted secretarial help for the project.

Schedule B further provided that the participating systems should match each funded dollar by a dollar fifteen although not necessarily in the same proportion for each item.

Reporting procedures and expectations were also delineated, with the payment of funds to the co-ordinating member directly linked to the receipt of the year-end progress and summary reports by the Department of Education.

The contract allowed for additions or deletions by mutual agreement and in accordance with this clause, (Clause 7, Page 3) an addition and amendment was made (Appendix B). The addition and amendment clarified Consortium member rights and privileges with respect to the copyright, distribution and right of reproduction of the project materials. It further outlined the manner of disbursement for any royalties which might accrue through the release of project materials to a commercial publisher. Appendix D outlines the percentage of accrued royalties that each system would be entitled to in accordance with Section 5 of the addition and amendment to the contract.

8. DESIGN OF THE PROJECT (Cont'd.)

B. 5. Co-ordinating Member

A consortium of school systems is not a legal entity. As a result, the agreement with the Department of Education was made by the Edmonton Public School Board, acting on behalf of the other nineteen systems involved.

The co-ordinating system had the major responsibility for providing a project co-ordinator, liaison with the Department of Education, accounting facilities and overall responsibility for the general operation of the project.

More specifically, the responsibility for the dissemination and monitoring of Department of Education funds was given to the Edmonton Public School Board as stated on Page 8, in Section B, Part 1, and Section C of the contract. In addition to allocating the Department of Education funds the Edmonton Public School Board had the responsibility of monitoring the expenditures of member systems, maintaining financial records of both Department of Education and system funds expended on the project, and issuing an annual audited financial statement to the Department of Education and member systems.

These extra responsibilities were carried out in addition to the regular project work and no extra Department of Education funds were allocated for them.

8. DESIGN OF THE PROJECT (Cont'd.)

B. 6. Allocation of Funds

As previously noted, the co-ordinating system was responsible for the dissemination of the Department of Education funds. An equitable distribution of these funds was approved by the consortium executive and ratified at a general meeting of the member systems. This procedure was followed for both years of the project.

The distribution of funds to member systems was for teacher release time only. The actual percentage of Department of Education funds paid to each system was directly proportional to the percentage that each system's junior high enrolment was to the consortium total. The enrolment figures used were those obtained from the Department of Education for the 1974 and 1975 years. The payments made for 1975 were based on the 1974 enrolment figures and the payments made for 1976 were based on the 1975 enrolment figures.

Provisions were made for advance payments when requested so as not to incur hardship or inconvenience on any system. Regular payments were made bi-annually to member systems upon receipt of a certified statement of expenditures.

7. Membership

Two members named in the original proposal to the Department of Education withdrew before the project was initiated. These systems, Lethbridge R.C.S.S.D. #9 and High Prairie School Division #48, were replaced by the County of Mountain View #17 and the County of Vulcan #2 respectively. The two members that withdrew did not complete any work nor did they receive any funding. Apart from this the membership in the Consortium remained unchanged with all twenty systems participating for the duration of the project.

8. DESIGN OF THE PROJECT (Cont'd.)

B. 7.

Although several requests and/or inquiries were received, no additional members were included beyond the original limit of twenty. This policy was established by executive motion because of the difficulties inherent with the redistribution of funds and reassigning or interrupting the zone tasks.

9. RESULTS OF THE PROJECT

A. Program Overview

Through the cooperative efforts of the teachers of the twenty member systems a multi-faceted junior high mathematics program has been produced. The many components of the program produced in accordance with the objectives of the contract (Page 9, Appendix "A" of the contract) and their intended use are outlined below. Two sections of the teacher's resource book, Applications and History, were not requirements of the contract but were added to broaden the scope and increase the effective use of the program.

1. Program Components

The Junior High Mathematics Program is composed of two basic sets of materials. Most of the components are designed for teacher use and are intended to facilitate lesson planning and classroom instruction. The second set of materials is for student use and basically consists of exercise booklets. The components are as follows:

(a) Teacher Materials

Teacher materials consist of:

(i) Management Guide
(ii) Teacher's Resource Book

9. RESULTS OF THE PROJECT (Cont'd.)

A. 1. (a)

(iii) Cross-Reference Manual
(iv) Basic Skills Supplement
(v) Test Item Bank

(b) Student Materials

For each grade level, the exercises for all the objectives are packaged into two booklets. Thus, grade seven has two exercise booklets; grade eight, two booklets; and grade nine, two booklets.

2. Program Overview

The Junior High Mathematics Program is based on a set of performance objectives (Appendix E) which define the program's scope and sequence. The strands used in the elementary school are retained to assist articulation between elementary and junior high school grades. The Junior High Mathematics strands are:

(a) Numbers,Operations and Properties
(b) Numeration
(c) Measurement
(d) Geometry
(e) Applications
(f) Algebra (additional Grade Nine strand)

The objectives have been sequenced into teaching units. It is hoped teachers will maintain the suggested unit sequence to facilitate pupil transfer, inservice programs and cooperative planning. Within each unit some of the objectives are asterisked to indicate that they are an extension to the core program. It is the teacher's responsibility to select the asterisked objectives which are appropriate for her students. ?

3. Program Components

The program components were developed by using the course objectives as a basis. These components were designed to

9. RESULTS OF THE PROJECT (Cont'd)

A. 3.

accomplish three goals:

-To define the Junior High Mathematics Program.

-To provide teachers with curriculum support materials to achieve these objectives.

-To provide teachers with a reliable means of monitoring student achievement.

The program components are:

(a) Management Guide

(i) Management Section

The purpose of the Management Guide is to acquaint teachers with the components of the Junior High Mathematics Program. Various suggestions are included regarding timelines, instructional pathways and general classroom techniques which may facilitate the instruction of mathematics in the classroom.

(ii) Audiovisual Reference Guide

The audio-visual section contains an evaluation of audio-visual materials which are referenced to the performance objectives.

(b) Teachers Resource Book

(i) Performance Objectives

A set of objectives which define the Junior High Mathematics Program's scope and sequence.

(ii) Learning Package

Consists of lesson developments, keyed exercises for each objective, and keyed review exercises.

The learning package for each unit was developed to provide the teacher with instructional materials

9. RESULTS OF THE PROJECT (Cont'd)

A. 3. (b) (ii)

which would facilitate the teaching of the course objectives. The contents of each package were written by Alberta junior high mathematics teachers using materials and techniques they have found successful.

The objective developments are not intended to be prescriptive in either content or approach. This section is provided as a service to teachers with the intent that the ideas presented will be helpful in reducing the amount of time required for lesson preparation.

The suggested developments were written for the teacher and therefore are not intended for student self-study. The developments usually focus on only one objective; therefore, each unit should be previewed with the purpose of combining a number of consecutive objectives for more effective teaching and continuity.

(iii) Activities Section

Provides the teacher with activities which are designed to be both instructional and motivational. Teacher-made activities were researched and those deemed useful are included in the unit to which they apply.

(iv) Applications Section

Relates the mathematical skills for selected objectives to practical applications used in everyday life.

(v) History of Mathematics Section

Provides background information relating to the history of mathematics as applicable to selected objectives.

9. RESULTS OF THE PROJECT (Cont'd.)

A. 3. (b)

(vi) Labs Section

Provides laboratory experiments through which students may discover mathematical concepts. A number of labs have been field-tested and those found successful were included in the unit to which they apply.

(vii) Transparency Masters

Provide demonstration models, sample problems and student notes.

(c) Cross-reference Manual

The Cross-reference Manual provides the teacher with an index of textbook references in which the development of an objective or related exercises are to be found. If no text references are listed the teacher should refer to the learning package for the required development and exercises.

(d) Basic Skills Supplement

For this supplement a set of basic skills objectives has been identified and exercises for them have been developed. These exercises are of a high interest, motivational nature and may be used with students who would benefit from such a program.

(e) Student Exercise Books

The books contain:

(i) student concept check list for each unit
(ii) reminder "clouds" of major concepts and example problems
(iii) exercises for each objective
(iv) review exercises

9. RESULTS OF THE PROJECT (Cont'd)

A. 3.

(f) Test Item Bank

A Test Item Bank has been compiled by the Consortium using the Test Item Bank developed by the Edmonton Public School System as a basis.

The test items are packaged in looseleaf binders to allow for continuous up-dating and revision. The bank includes multiple choice, matching, completion and open-ended questions referenced to the objectives.

(g) Consortium Normed Survey Tests

A survey test, developed by the Edmonton Public School Board Pupil Assessment Department, has been normed using a sample of consortium schools.

A second, parallel survey test is currently being developed by the Consortium. The preparation and norming of this exam, coordinated by the Calgary Public School Board, will be completed for use in the 1977-78 school term.

4. Program Utilization

A teacher may utilize the program materials in several ways as shown by the following flow chart.

Objective: The teacher decides on the objective to be taught.

(a) Lesson Development: To develop the daily lesson the teacher decides to use the development provided in one of:

(i) The Text - as given in the Cross-reference Manual
(ii) The Program - as given in the Teacher's Resource Book
(iii) Teacher's Own - in other sources.

(b) Supplementary Materials: The teacher decides on the additional materials needed for his lesson.

9. RESULTS OF THE PROJECT (Cont'd)

A. 4. (b)

- (i) History of Mathematics - from the Teacher's Resource Book
- (ii) Low level exercises - from the Basic Skills Supplement
- (iii) Labs, Activities, Games - from the Teacher's Resource Book
- (iv) Audio-visuals - from the Audio-visual Guide
- (v) Applications - from the Teacher's Resource Book.

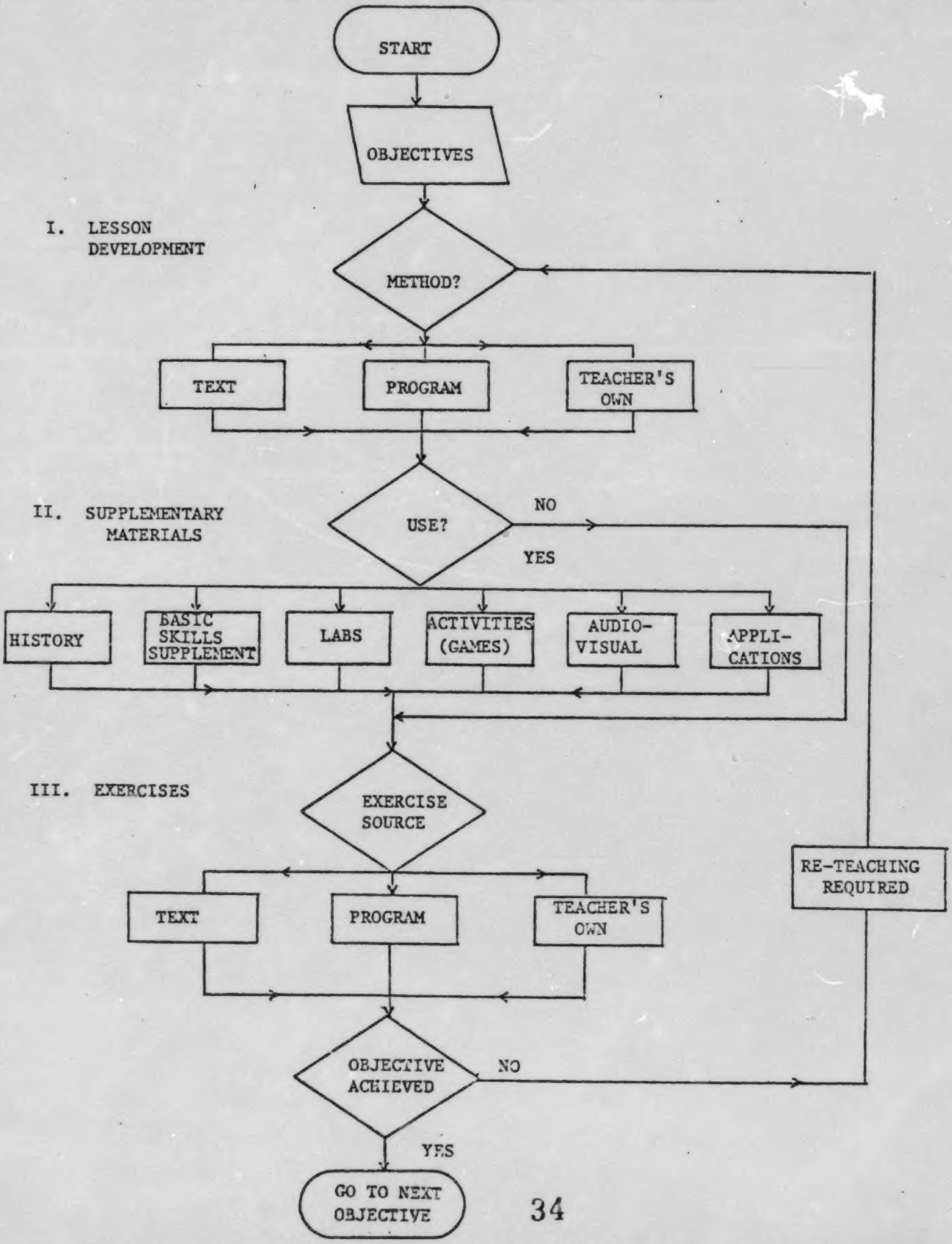
(c) Exercises: The teacher selects the pupil's exercises from:

- (i) The Text - as listed in the Cross-reference Manual
- (ii) The Program - as printed in the Student Exercise Books
- (iii) Teacher's Own - Other sources

The teacher may, of course, use combinations of the various components of the program. Several such combinations are given on the following page.

JUNIOR HIGH MATHEMATICS PROGRAM

DAILY INSTRUCTIONAL PATHWAYS


START
OBJECTIVES
I. LESSON DEVELOPMENT
METHOD?
TEXT
PROGRAM
TEACHER'S OWN
II. SUPPLEMENTARY MATERIALS
USE?
NO
YES
HISTORY
BASIC SKILLS SUPPLEMENT
LABS
ACTIVITIES (GAMES)
AUDIO-VISUAL
APPLI-CATIONS
III. EXERCISES
EXERCISE SOURCE
TEXT
PROGRAM
TEACHER'S OWN
RE-TEACHING REQUIRED
OBJECTIVE ACHIEVED
NO
YES
GO TO NEXT OBJECTIVE

9. RESULTS OF THE PROJECT (Cont'd)

B. Consortium Operation

In a questionnaire given to elicit the attitudes and feelings of the system representatives toward certain aspects of the consortium operation, the following generalities were noted: (N = 17)

1. With Respect to Communication

(a) With the Project Co-ordinator

One hundred percent of the respondents were generally satisfied with the lines of communication used by the project co-ordinator. Even though satisfied, one member noted that the large distances decreased the amount of one to one communication between the project co-ordinator and the other participants in his school system.

(b) With Other Systems

Eighty-three percent found communication between systems to be generally adequate. The remaining seventeen percent, while not suggesting communication was inadequate, found it generally unnecessary except at general or zone meetings.

2. With Respect to Geography

Sixty-five percent of systems expressed general satisfaction with no problems relating to distance. In many rural systems travel is a way of life and was not considered a problem. Thirty-five percent of the respondents considered the large distances detrimental to their work because they were unable to meet as often as they wished and found this had an effect on the cohesiveness of their local committee.

3. With Respect to the Zone Assignment

(a) Suitability

Eighty-two percent found the zone assignment realistic and suitable. Of the remainder, six percent expressed

9. RESULTS OF THE PROJECT (Cont'd)

B. 3. (a)

concern that their work load was too heavy for their resources; six percent indicated some frustration because of a lack of resources; and six percent were concerned with their lack of choice about the assignment. The latter did reflect however, that the lack of choice was a result of the complexity of the project.

(b) Timeline

Seventy-one percent of the system representatives indicated the time allotted for the zone assignment was fair and realistic. Twenty-nine percent indicated they were rushed on the final deadline with one system suggesting the timeline was not reasonable considering it was their first venture into cooperative curriculum writing.

4. Distribution of Funds

The funds were distributed twice yearly by the co-ordinating member and all systems were satisfied with the method and procedures used. Comments that should be noted include one that suggests that funding should be proportionate to the task; one that suggests the system obligation of a dollar for a dollar was unrealistic and should be fifty cents for a dollar of government funds;and one made by a large system that suggests too much money was given to the big systems and not enough to the smaller systems.

5. Allocation of Funds

Seventy-six percent of the system representatives were generally satisfied with the allocation of funds for teacher release and general expenditures. Fifteen percent were dissatisfied with the amount of funds allocated for teacher release while six percent thought that some funds should be allocated for supplies and printing. Six percent gave no reply.

9. RESULTS OF THE PROJECT (Cont'd.)

B. 6. Reporting Procedures

In all cases the systems indicated complete satisfaction with the procedures used to report their financial status. Each system submitted a financial report, certified by a responsible signing authority for the system, indicating expenditures in the areas of teacher release, secretarial, supplies, printing, postage, telephone and evaluation. This put the onus of responsibility on each system to ensure their statements were proper and correct. The project co-ordinator then compiled these statements for the year-end financial statements which were audited and distributed in accordance with the terms of the contract.

7. Personnel

a) Executive

Consensus of the system representatives was that the procedures for selecting the executive were good, the executive seemed to operate very well and the various areas of the consortium were suitably represented.

b) Project Co-ordinator

The project co-ordinator functioned very well and provided the necessary leadership in accordance with the expectations of all concerned. Opinion was divided as to whether or not this role should have been held by a Department of Education Consultant, but most system representatives agreed that within the existing consortium framework the co-ordinating member should provide the project co-ordinator.

8. Letter of Commitment/Board Motion

These were viewed as necessary by virtually all concerned. Reasons included: "assurance of assistance followed board motion", "security in knowing where you stand with the school board", and "showed the support of the central office staff for the project".

9. RESULTS OF THE PROJECT (Cont'd.)

B.

9. Slightly over sixty percent viewed the contract as "necessary" in order to get the job done and in order to receive government funding. Six percent thought it created a lack of flexibility for the allocation of funds necessary for supplies and personnel. Six percent were indifferent and twenty-four percent did not reply.

10. SIGNIFICANCE OF THE PROJECT

Among others, the following implications of the results of this project were noted:

A. With Respect to the classroom:

1. The needs of the students were best perceived by their teachers.
2. The program was of a multi-approach nature, allowing freedom of selection and increased flexibility in meeting the needs of teachers and students.
3. The materials developed allowed for individual differences in students. The needs of the basic core student, the low level achiever and the above average student were provided for.
4. The use of activities and mathematics labs provided a more active learning experience for the students.
5. To a large extent the use of the program provided assistance to teachers in unit planning.
6. The program was of great value to teachers in providing assistance for test construction.
7. The program was of great value to teachers in assisting their daily planning.
8. The evaluation of students was greatly assisted through the use of the program materials.
9. The program provided alternate teaching strategies to a large extent.
10. Teachers found the program interesting to teach.
11. Use of the program provided a more realistic statement of goals for the students involved.

10. SIGNIFICANCE OF THE PROJECT (Cont'd.)

B. With Respect to the School System:

1. The dissemination of successful teacher-developed materials can be done through the cooperation and sharing between systems.
2. Cooperation in a consortium enables systems with limited resources to be actively involved in curriculum development.
3. Cooperation between systems leads to increased system awareness of new curriculum developments as well as existing curriculum projects in other parts of the province.
4. Through cooperation with large systems, systems with limited resources gain indirect access to resource personnel and computer facilities.
5. The standardization of content within the Consortium decreased the disruption in the learning sequence of those students transfering to other schools or systems.
6. Use of the program has provided a direction of emphasis and definition of objectives for each system within the Consortium.
7. Use of the objectives provides a consistency that is reflected throughout the system.
8. Teachers are highly receptive to the use of a program which they have helped to develop.

C. With Respect to Education:

1. The consortium model of curriculum development has proven to be a viable method.
2. Locally developed curriculum reflects the attitudes and values of those directly involved in its use.
3. The continuation of the Mathematics Consortium on an informal basis by virtually all concerned reflects the importance that individual systems attach to the organization.
4. Parental attitude towards the mathematics program has been very positive in a majority of the member systems.
5. Teachers develop skill and expertise in curriculum building through the cooperation with and the exposure to, the resource personnel and other teachers involed in the project.

10. SIGNIFICANCE OF THE PROJECT (Cont'd.)

C.

6. Systems have shown an overwhelming support of cooperative curriculum development as shown by the financial support almost double that of their contracted commitment.
7. The needed changes in curriculum to meet the ever changing needs of society are best identified by the teachers who are involved in curriculum building.
8. Provincial standardization of curriculum content can be achieved through the cooperation of a consortium of school systems.
9. The effectiveness of mathematics education can be measured more accurately when based on a standardized program.
10. The successful implementation of change on a province-wide basis requires the active participation of those who will be using it.
11. The decentralization of curriculum development to the teacher level can be effectively achieved through the operation of a consortium of school systems.

11. SUMMARY OF DIFFICULTIES ENCOUNTERED IN CARRYING OUT THE PROJECT

The operation of the project proceeded remarkably well with no major difficulties reported. Some items or minor concern which should be noted include:

1. The difficulty in obtaining substitutes for teachers.
2. The differential between systems of the rate paid for contract time ($50 - $60 per day versus 1/200 of the teachers annual salary).
3. The preference of teachers for contract time (at 1/200) rather than release time which took them away from their teaching duties for which they still remained responsible.

12. REQUESTED PROJECT CHANGES

None.

13. SIGNATURES

CONTACT PERSON
(Director of Research)

Tom Blowers
DR. T. A. BLOWERS

PROJECT CO-ORDINATOR

Richard L Rideout
MR. RICHARD L. RIDEOUT

SUPERINTENDENT OF SCHOOLS
and SECRETARY-TREASURER
(for the coordinating system)

MR. M. A. STREMBITSKY

Alberta
EDUCATION

APPENDIX A

Telex 037-3406
Executive Building
10105 - 109 Street
Edmonton, Alberta, Canada
T5J 2V2

November 28, 1974

Dr. T. Blowers
Director of Research
Edmonton Public Schools
10010 - 107A Avenue
EDMONTON, Alberta

Dear Dr. Blowers:

Enclosed please find the latest contract for the Mathematics Consortium. I think that it incorporates all of the changes upon which we have agreed. If not, would you please let me know.

Thank you for continuing cooperation in this endeavor. I believe we are going to get there!

Yours sincerely

L. R. Tolman
Associate Director of Curriculum

LRT/smb

Enclosure

THIS AGREEMENT made this 6th day of January, 1975

BETWEEN

Her Majesty the Queen in Right of the Province of Alberta as represented herein by the Minister of Education,

(hereinafter called "the Minister")

OF THE FIRST PART

-and-

The Edmonton Public School Board on behalf of a consortium of school systems including:

Calgary R.C.S.S.D. #1
County of Leduc #25
County of Parkland #31
County of St. Paul #19
County of Strathcona #20
Edmonton School District #7
Edmonton R.C.S.S.D. #7
Fort McMurray R.C.S.S.D. #32
Red Deer School District #104
St. Albert P.S.S.D. #6
Foothills School Division #38
Calgary School District #19
Bonnyville School Division #46
Red Deer R.C.S.S.D. #17
County of Ponoka #3
High Prairie School Division #48
Falher Consolidated School District #69
Lethbridge R.C.S.S.D. #9
County of Beaver #9
St. Paul School District #2228

(hereinafter called "the Consortium")

OF THE SECOND PART

WHEREAS the Parties have agreed that the Consortium shall undertake a project for the purposes set out in Schedule "A" hereto;

NOW THEREFORE THIS AGREEMENT WITNESSESETH that in consideration of the mutual covenants and agreements hereinafter set forth and other good and valuable consideration, the parties agree as follows:

1. The Province hereby appoints the Consortium for the purpose and covering the subject matter set out in Schedule "A" attached hereto, which Schedule shall be considered an integral part of this contract.

2. In consideration of the services rendered to the Province by the Consortium hereunder, the Province shall pay to the Edmonton Public School Board in trust for the Consortium the amount and at the times set out in Schedule "B" hereto, which Schedule shall be construed as being an integral part of this Agreement.

It is understood that the total amount set out in Schedule "B" shall be the total amount paid by the Minister and the Consortium shall not incur any debts or liabilities on behalf of the Province or its agents and shall keep the Province and its agents indemnified against all such debts or liabilities incurred.

3. (a) For each year of the contract, the Consortium Executive shall prepare a written summary of the project's status, and deliver a copy of such a report to the Curriculum Branch on or before December 31. *

(b) For the final year of the contract, the Consortium Executive shall deliver to the Curriculum Branch a full written report containing its conclusions upon completion of the study and a copy of the report will also be delivered to the Planning and Research Branch of the Department of Education on or before February 28, 1977.

4. It is understood and agreed that this Agreement is a contract for the performance of a service and any employees engaged in this project hereby agree

to a waiver of claim on any form of fringe benefits which might normally accrue to employees of the public service of the Province of Alberta.

5. The Consortium shall save harmless the Province from and against all claims, demands, losses, costs, damages, actions or suits resulting directly and solely as a result of the Consortium incorrectly reporting statements prepared by third parties or incorrectly quoting any person.

6. The Agreement shall commence on the 6th day of January 1975, and terminate on the 31st day of December, 1976.

7. Notwithstanding that it is the intention of the Parties that this agreement expresses the whole of the contracted relations between them, the Province and the Consortium may add to, delete, vary or amend the terms of this contract by mutual agreement.

IN WITNESS WHEREOF this agreement has been duly executed by the parties hereto.

Dated at Edmonton, Alberta this 6th day of January 1975.

Edmonton Public School Board Chairman

Edmonton Public School Board/
Superintendent of Schools-Secretary-Treasurer

Witness

for the Consortium

for the Consortium

for the Consortium

for the Consortium

for the Consortium

for the Consortium

A/Deputy Minister of Education

Schedule "A"

This is Schedule A to an agreement dated the 6th day of January ,1975, between the Minister of Education, and the Consortium on Junior High School Mathematics and shall be considered as an integral part of this Agreement.

Terms of Reference

Re: Project for Implementation and Revision of Junior High Mathematics Materials

The Department of Education is prepared to support the above-noted project for the period commencing January 6, 1975, and terminating December 31, 1976. This support is offered on the following understandings:

A. Objectives of the Project

The Consortium will seek to fulfill those objectives specified on page 4a of the proposal for the project: "Implementation and Revision of Junior High Mathematics Curriculum Materials". (See Appendix A).

B. Priority of the Project for Member Systems

School systems participating in the Consortium shall determine the status of this project relative to other curriculum development activities in which they are engaged. The monies invested by them in this project should reflect the priorities which they attach to it. Prior to the release of Department of Education funds, each participating school system must submit to the Department of Education:

a. For the first 50% noted in item B,2 of Schedule B, page 7 of this agreement, a letter from the Chief Executive officer of each participating school system indicating agreement to provide financial support for the project,
as prorated by the consortium

b. For subsequent payments as also noted in Schedule B, Item B,2, a duly passed board (or school committee) motion indicating agreement to provide financial support as prorated by the consortium for the project.

Unless otherwise agreed upon, in writing, by both parties to this agreement, the sum total of all contributions by participating school systems shall equal not less than $115,700.00.

C. Project Materials

The Department of Education shall have the right to reproduce and disseminate project materials produced during the term of this agreement to school systems in Alberta should it choose to do so.

D. Evaluation

a. The Consortium will build into its evaluation design, appraisal of the appropriateness of the present Alberta Junior High School mathematics curriculum in terms of its objectives, content, and materials. A final report on this evaluation shall be presented to the Department of Education on or before December 31, 1976.

b. The Department of Education reserves the right to conduct an independent evaluation of the project at a time and in a manner of their choice should they wish to do so.

Schedule "B"

This is Schedule B to an Agreement dated the 6th day of January, 1975 between the Minister of Education, and the Consortium on Junior High School Mathematics.

and shall be considered as an integral part of the Agreement.

Financial Arrangements

7

(1) A. Budget

The Department of Education will provide $100,000. Participating school boards will provide $115,700. The planned budget is as follows:

JUNIOR HIGH MATHEMATICS PROJECT BUDGET

Description	1975 ~~1974-1975~~		1976 ~~1975-1976~~	
	Dept.	Consort.	Dept.	Consor
1. Release Time for Participating Teachers	34,400	14,400	39,600	17,200
2. Secretarial	-	12,000	-	13,800
3. Contracted Secretarial	3,000	-	3,540	-
4. Mathematics Consultants	-	2,000	-	2,000
5. Travel & Subsistence for Participating Teachers	3,500	-	3,500	-
6. Supplies & Equipment				
(a) Paper	-	1,500	-	1,500
(b) Printing Costs-Commercial	-	21,000	-	21,000
(c) Stationery	-	500	-	500
7. Evaluation	5,550	3,000	7,000	3,000
8. Telephone	-	300	-	300
9. Postage	-	600	-	600
10. Auditing	-	250	-	250
TOTALS	46,450	55,550	53,550	60,150

B. Payment and Distribution of Departmental Monies

1. Monies provided by the Department of Education will be forwarded to the Edmonton Public School Board for distribution among participating systems equitably. An equitable distribution shall be recommended by the Consortium Executive and approved by representatives of all member systems.

2. For each calendar year of the contract, 50% of the annual payments by the Department of Education will be paid in January, 30% in April, and the final payment (20%) will be paid upon receipt and approval of the annual report referred to in Item 3(a), page 2.

C. Accounting

An audited financial statement including all items in the Consortium's budget shall be presented to member systems and the Department of Education at the end of each year of the project's operation. Each statement shall include a record of credits and debits for both Departmental and school system funds.

D. Release Time is understood to include regular teaching days on which teachers are relieved of teaching duties in the classroom as well as any other time when they may agree to work on behalf of the consortium and be eligible for remuneration from the consortium.

The Department of Education Liaison Officer for this project will be:

Dr. L. R. Tolman
Associate Director of Curriculum
Department of Education
Executive Building
10105 - 109 Street
EDMONTON, Alberta T5J 2V2 Telephone: 229-3202

APPENDIX "A"

Objectives of the Project, in Measurable Terms

a. Terminal Objectives - anticipated pupil outcomes

b. Enabling Objectives - these are the procedures to be used to meet the terminal objectives.

c. Performance levels should be included in the statements of Objectives. (The objectives of the project should constitute a statement of the proposed solution or solutions for the problem or part of the problem.)

a. Objectives Developed → Developed program materials for grades 7, 8 & 9. (Joint effort of ten school systems) → Field test, evaluate and revise program materials (Joint effort of 20 school systems) → Implement revised program. Development of support materials. (Joint effort of 20 school systems) →

b. 1. To field test, evaluate and revise the set of existing unit booklets which provide support materials for the instruction of mathematics. These unit books provide (a) references to texts presently used by the systems. (b) activities which may be used to reinforce the objectives and (c) suggested developments and exercises for each objective. The development of the objectives is intended as a teacher reference and not as materials for student self-study.

2. To evaluate the Junior High Mathematics course objectives with respect to their mathematical appropriateness.

3. To develop a back of valid and reliable test items which teachers can use to monitor student achievement.

4. To write a teacher handbook which contains (a) notes on the components of the program (b) some suggestions for the utilization of program booklets (c) a complete set of levels 7, 8 and 9 objectives to serve as a reference for the teacher of the skills and concepts covered by the students and (d) program management system will be provided to facilitate the upkeep of student profiles, and records of student achievement.

5. To provide supplementary materials for special purposes such as remediation, audio-visual references and transparency masters.

6. To provide in-services to aid teachers in utilizing the different teaching modes and varied instructional materials in their instruction of mathematics.

BUDGET ALLOTMENTS

1975 CALENDAR YEAR

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

		Enrolment (# of JHS Pupils)	Percent of Total Consortium Enrolment	Projected Department of Education Disbursement (Dollars)	Contribution of Consortium (Dollars)
1.	Calgary Separate	5,762	8.46	3,930	4,667
2.	Foothills	981	1.44	669	794
3.	Calgary Public	21,488	31.54	14,650	17,353
4.	Lethbridge Separate	643	.94	437	520
5.	Town St. Paul	374	.55	255	302
6.	County St. Paul	512	.75	348	414
7.	Bonnyville	752	1.10	511	609
8.	Red Deer Public	1,474	2.16	1,003	1,193
9.	Red Deer Separate	367	.54	251	297
10.	Ponoka	1,016	1.49	692	822
11.	Strathcona	2,386	3.50	1,626	1,932
12.	Beaver	561	.82	381	454
13.	Leduc	1,361	2.00	929	1,102
14.	St. Albert Separate	769	1.13	535	622
15.	Parkland	1,531	2.25	1,045	1,240
16.	Edmonton Separate	8,047	11.81	5,486	6,818
*17.	Edmonton Public	18,724	27.49	12,769	15,266
18.	Falher	143	.21	97	150
19.	High Prairie	1,004	1.47	683	813
20.	Fort McMurray	225	.33	153	182
		68,120	99.98%	46,450	55,550

BUDGET ALLOTMENTS

1976 CALENDAR YEAR

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

		Enrolment (# of JHS Pupils)	Percent of Total Consortium Enrolment	Projected Department of Education Disbursement (Dollars)	Contribution of Consortium (Dollars)
1.	Calgary Separate	5,762	8.46	4,530	5,089
2.	Foothills	981	1.44	771	866
3.	Calgary Public	21,488	31.54	16,890	18,971
4.	Lethbridge Separate	643	.94	503	565
5.	Town St. Paul	374	.55	295	331
6.	County St. Paul	512	.75	402	451
7.	Bonnyville	752	1.10	589	662
8.	Red Deer Public	1,474	2.16	1,157	1,299
9.	Red Deer Separate	367	.54	289	325
10.	Ponoka	1,016	1.49	798	896
11.	Strathcona	2,386	3.50	1,874	2,105
12.	Beaver	561	.82	450	493
13.	Leduc	1,361	2.00	1,071	1,203
14.	St. Albert Separate	769	1.13	605	680
15.	Parkland	1,531	2.25	1,205	1,353
16.	Edmonton Separate	8,047	11.81	6,324	7,104
*17.	Edmonton Public	18,724	27.49	14,721	16,549
18.	Falher	143	.21	112	126
19.	High Prairie	1,004	1.47	787	884
20.	Fort McMurray	225	.33	177	198
		68,120	99.98%	53,550	60,150

AMENDMENT TO AGREEMENT

Pursuant to clause seven, page three of an agreement made the 6th day of January, 1975 between the Minister of Education of the Province of Alberta and the Edmonton Public School Board on behalf of a consortium of school systems, this hereby adds to and amends this agreement.

To ensure the protection of the copyright materials produced during the duration of the project and to guarantee the right of access to project materials to both the Department of Education and the consortium members the parties hereto agree as follows:

1. That the Edmonton Public School Board, as the co-ordinating member of the Consortium holds any and all rights to the materials produced during the duration of the project.
2. These rights will remain in effect even after the expiration of the project. (Dec. 31, 1976)
3. These rights will not, in any way negate or infringe upon the contracted right of the Department of Education to reproduce and disseminate project materials within the province of Alberta at any time.
4. Each participating member of the Consortium retains the right in perpetuity to reproduce the project materials for its own use, for the use of other consortium members and for distribution of single sample copies to others, requiring neither permission from nor payment of royalty to, the Edmonton Public School Board.
5. Should at some future time the project materials be released to a commercial publisher then the disposition of any and all net benefits accruing from such disposition be distributed to the consortium members in proportion to their financial contribution as indicated on the financial statements for the project.

. . . 2

IN WITNESS WHEREOF this addition and amendment has been duly executed by the parties hereto.

Dated at Edmonton, Alberta this 23 day of March, 1976.

Harrison
Edmonton Public School Board Chairman

Edmonton Public School Board
Superintendent of Schools-Secretary-Treasurer

Witness

76/03/02
for the Consortium

for the Consortium

for the Consortium

for the Consortium

Mackenzie
for the Consortium

for the Consortium

2/3/76
A/Deputy Minister of Education

APPENDIX C

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

MATHEMATICS CONSORTIUM SYSTEM REPRESENTATIVES

	SYSTEM	REPRESENTATIVES
1.	Edmonton Public School District #7	Mr. Dave Mackenzie, Mathematics Consultant
2.	Edmonton Separate School District #7	Dr. Bill Bober, Supervisor of Mathematics
3.	County of Leduc #25	Mr. Bob MacDonald, Assistant Superintendent
4.	County of Parkland #31	Mr. Don Beggs, Assistant Superintendent
5.	St. Albert Protestant Separate School District #6	Mr. John Curilla, Supervisor of Instruction
6.	County of Strathcona #20	Mr. C. Clarke, Director of Secondary Education
7.	Calgary School District #19	Mr. Marshall Bye, Supervisor of Mathematics
8.	Calgary Roman Catholic Separate School District #1	Mr. Terry Bressenutti, Supervisor
9.	Foothills School Division #38	Mr. Ross Burton, Assistant Superintendent
10.	County of Vulcan #2	Mr. Len Miller, Superintendent
11.	County of Ponoka #3	Mrs. Jean Martin, Director of Curriculum
12.	Red Deer School District #104	Mr. Jack Kokotailo, Coordinator of Instruction
13.	Red Deer Roman Catholic Separate School District #17	Mr. Joe Docherty Superintendent
14.	Mountain View County #17	Mr. Ed Halina, Assistant Superintendent
15.	Falher Consolidated School District #69	Sister M. Poirier
16.	Fort McMurray Roman Catholic Separate School District #32	Mr. Bob Deslippe, Assistant Principal
17.	Bonnyville School Division #46	Mrs. Elaine Doonanco
18.	County of Beaver #9	Mr. Les Ellsworth, Principal
19	County of St. Paul #19	Mr. Ray Hellquist
20.	St. Paul School District #2228	Mr. Leroy Smith, Assistant Principal

APPENDIX D

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

JUNIOR HIGH MATHEMATICS CONSORTIUM

TOTAL PROJECT EXPENSES FOR EACH SYSTEM

(Excluding Department of Education Funding)

		1975	1976	Total	% of Total
1.	Edmonton Public School Board	27 142.50	25 680.02	52 822.52	26.297
2.	Edmonton Separate School Board	11 162.00	12 143.00	23 305.00	11.602
3.	County of Leduc #25	1 691.15	1 726.05	3 417.20	1.701
4.	County of Parkland #31	1 285.75	2 982.20	4 267.95	2.125
5.	St. Alberta P.S.S.D. #6	3 510.67	6 839.00	10 349.67	5.152
6.	County of Strathcona #20	8 484.90	2 743.50	11 228.40	5.590
7.	Calgary School District #19	19 858.15	28 927.16	48 785.31	24.287
8.	Calgary R.C.S.S.D. #1	12 251.00	5 265.00	17 516.00	8.720
9.	Foothills School Division #38	2 861.65	3 754.08	6 615.73	3.293
10.	County of Vulcan #2	1 141.29	220.35	1 361.64	0.678
11.	County of Ponoka #3	1 145.69	1 963.42	3 109.11	1.548
12.	Red Deer School District #19	1 159.00	1 508.34	2 667.34	1.328
13.	Red Deer R.C.S.S.D. #17	356.82	422.29	779.11	0.388
14.	Mountain View County #17	807.70	2 354.46	3 162.16	1.574
15.	Falher Consolidated S.D. #69	119.85	157.00	276.85	0.138
16.	Fort McMurray R.C.S.S.D. #32	714.40	1 059.00	1 773.40	0.883
17.	Bonnyville School Division #46	991.20	1 666.76	2 657.96	1.323
18.	County of Beaver #9	541.48	1 180.19	1 721.67	0.857
19.	County of St. Paul #19	487.00	1 579.16	2 066.16	1.029
20.	St. Paul School District #2228	1 249.35	1 737.00	2 986.35	1.487
	TOTAL:	$96 961.55	$103 907.98	$200 869.53	100.00%

JUNIOR HIGH MATHEMATICS PERFORMANCE OBJECTIVES

LEVEL 7

January 20, 1977

UNIT I - SET THEORY

Students should be able to:

1. Use symbols such as $\{\ \}$, $\in$, $\emptyset$, ... , when referring to sets.
2. Tabulate five sets from their everyday life.
   (Limit: five elements)
3. Select the sets that contain only the elements from a given universe.
4. List all the subsets, (including the empty set) for any given set.
   (Limit: four elements)

*5. Use Venn diagrams to represent a set and one of its subsets.

6. Determine from a list of sets which sets are equal.

*7. Determine from a list of sets which sets are equivalent.

8. Determine if a given set is finite or infinite.

UNIT II - WHOLE NUMBERS

Students should be able to:

1. Compare the set of whole numbers and the set of natural numbers by plotting both sets on a number line.
2. Demonstrate need for whole numbers (e.g. closure property).
3. Write any whole number in expanded form.
4. Write any whole number in standard form given the expanded form.
5. Perform the operations of addition and subtraction with whole numbers using the following terminology: addend, sum, difference, subtrahend, minuend.
6. Perform the operations of multiplication and division with whole numbers using the following terminology: multiplicand, multiplier, product, divisor, dividend, quotient.

7. Use symbols and notation illustrated below.

   a. Multiplication (i) $3 \times 4 = (3)(4) = 3(40$

      (ii) $3x = (3)(x) = 3(x)$

   b. Division (i) $\frac{9}{3} = 9 \div 3 = 3\overline{)\,9}$

      (ii) $\frac{x}{9} = x \div 9 = 9\overline{)\,x}$

8. Demonstrate the use of identity elements and the zero property. (De-emphasize terminology)

9. Demonstrate that division by zero is undefined.

10. Evaluate an expression by using the properties to produce short cuts in the computation. (De-emphasize terminology)

    e.g. $4 \times 23 \times 25 = n$

    $100 \times 23 = n$

11. Evaluate expressions involving the order of operations. (Limit: Expressions of the type $7 + 5 - 4 - 3 \times 1 =$.)

12. Evaluate expressions by substituting for the variable. (Limit: Whole numbers and one variable.)

13. Solve conditions for equality using an informal approach for the following types. (Limits: Whole numbers.)

    a. $A + x = B$ c. $Ax + B = C$

    b. $Ax = B$ d. $Ax + Bx = C$

    Note: *Make sure you check the level of difficulty before having the students use an informal approach.*

14. Verify solutions of conditions by substitution.

15. Use some formalized approach to solving conditions. (e.g. flow charts, related number sentences.

    a. $A + x = B$ c. $Ax + B = C$

    b. $Ax = B$ d. $Ax + Bx = C$

16. Write English sentences for mathematical sentences.

17. Write mathematical sentences for English sentences.

18. Solve problems using any organized approach.

UNIT III - RATIONAL NUMBERS

A. Factors and Multiples

Students should be able to:

1. Maintain all previously developed skills and ideas: primes, composites, factors, multiples, and divisibility.

2. List the set of factors for whole numbers. (Limit: 100)

3. Write the prime factorization for whole numbers. (Limit: 100)

*4. Obtain the G.C.F. for a set of four whole numbers. (Limit: 100)

*5. Obtain the L.C.M. for a set of four whole numbers. (Limit: 100)

*6. Determine if a pair of whole numbers is relatively prime. (e.g. prime factorization) (Limit: 100)

B. Fractional Numerals

Students should be able to:

1. Maintain previously developed skills and ideas: numerators, denominators, basic fractions, equivalent fractions, mixed numerals, improper fractions, and the order of fractions.

2. Demonstrate the need for fractional numbers. (e.g. solve conditions of the type $3x = 8$).

3. Recognize fractional numerals of the form $\frac{a}{b}$ as:

    a. part of a whole
    b. part of a group
    c. a measure
    d. a ratio
    e. division

*4. Demonstrate that the whole numbers are a subset of the fractional numbers using Venn diagrams.

5. Demonstrate knowledge of the fractional numbers by plotting a given set on a number line.

6. Demonstrate the use of identity elements and the zero property. (De-emphasize terminology.)

7. Generate sets of equivalent fractions. (Limit: 5)

*8. Find the L.C.D. (e.g. using L.C.M.)

9. Reduce any fraction to its basic form. (e.g. using G.C.F.)

10. Perform the operations of addition and subtraction with fractional numbers. (Limit: 1 digit denominators.)

11. Demonstrate the use of reciprocals to obtain the identity element.

12. Perform the operations of multiplication and division with fractional numbers. (Limit: 1 digit denominators.)

13. Demonstrate that division by zero is undefined.

14. Evaluate an expression by using the properties to produce short cuts in computation. (De-emphasize terminology)

    e.g. $\frac{1}{2} + \frac{1}{4} + \frac{1}{2} = 1 + \frac{1}{4} = 1\frac{1}{4}$

15. Evaluate expressions involving order of operations.

    e.g. $(\frac{3}{4} \times \frac{4}{5} + \frac{6}{12} \div \frac{3}{4} =)$

16. Order fractional numerals using the symbols: < , >, = .

C. Decimals

Students should be able to:

1. Maintain previously developed skills and ideas: change fractions to decimals by use of equivalent fractions, place value to 1 000ths.

2. Write any decimal numeral in expanded form. (Use exponential notation only if previously taught).

3. Write any decimal numeral in standard form given expanded form. (Use exponential notation only if previously taught)

4. Order decimal numerals using the symbols < , >, = .

5. Demonstrate knowledge of decimals by plotting a given set on the number line. (Limit: 100th)

6. Perform operations of addition and subtraction with decimal numerals.

7. Round off decimal numerals. (Limit: 1 000ths)

8. Multiply and divide decimal numerals by powers of 10.

9. Perform operations of multiplication and division with decimal numerals.

10. Convert fractions to decimals by dividing the numerator by the denominator. (Limit: denominators of 100)

11. Convert decimals to fractions. (Limit: repeating zero and 3rds)

12. Use symbols and notation illustrated below. (Use fractions and decimals)

    a. Multiplication (i) $0.25 \times 0.1 = (0.25)(0.1)$

    (ii) $0.3y = (0.3)(y) = 0.3(y)$

    b. Division (i) $\frac{0.5}{0.4} = 0.5 \div 0.4 = 0.4\overline{)0.5} = 0.5(\frac{1}{0.4})$

    (ii) $\frac{0.2y}{0.5} = \frac{0.2}{0.5}\,y = 0.2 \div 0.5 = \frac{0.2}{0.5}\,(y)$

13. Evaluate expressions by substituting for the variable. (Use fractions and decimals and one variable)

14. Solve the following types of conditions. (Use fractions and decimals)

    a. $A + x = B$
    b. $Ax = B$
    c. $Ax + Bx = C$
    d. $Ax + B = C$

15. Verify solutions of conditions by substitution.

16. Write English sentences for mathematical sentences.

17. Write mathematical sentences for English sentences.

18. Solve problems using an organized approach. (Use decimals and fractions)

UNIT IV - RATE, RATIO & PERCENT

Students should be able to:

1. Maintain previously developed skills and ideas: change fractions to an equivalent fraction whose denominator is 100.

2. Express rates, and ratios in the form $\frac{a}{b}$.

3. Find the missing component in any rate or ratio expressed in the equivalence condition form.

    e.g. $(\frac{3}{5} = \frac{x}{20})$

4. Solve problems involving rates and ratio.

*5. Convert fractions to percent.

*6. Convert percent to fractions.

*7. Convert decimals to percent.

*8. Convert percent to decimals.

*9. Solve problems involving percent.

UNIT V - MEASUREMENT

Students should be able to:

1. Explain measurement as a comparison to some unit.

2. State reasons as to why a standardized system of measurement is necessary.

3. Express measurements correctly by including the numeral and unit.

4. List the SI prefixes and explain what they mean, as well as the mathematical relationship that exists between each. (Limit: mm, cm, dm, m, dam, hm, km)

5. Convert SI units of length from one unit to another. (Limit: mm, cm, m, km)

6. Measure objects accurately using the SI units of length. (Limit: mm, cm, m)

7. Estimate the measure of various objects using the SI system and check by measuring.

8. Perform operations of addition and subtraction with SI units of measure.

9. Solve problems involving measurement.

*10. Write the standard units of mass and capacity in SI and use SI prefixes to generate larger and smaller units.

UNIT VI - EXPONENTS

Students should be able to:

*1. Use the terms base, power, exponent, square, and cube.

*2. Write the values for powers. (Limit: bases-whole, exponent-whole) Standard name of a power numeral.

*3. Use exponential notation to write the expanded form of whole and decimal numerals.

UNIT VII - GEOMETRY

Students should be able to:

1. Maintain previously developed skills and ideas: point, line, ray, segment, plane, space, and their symbols.

2. Determine whether two polygons or circles are congruent. (e.g. tracing)

3. Fill in the necessary requirements to complete the diagrams for the motion of a slide using correct correspondence notation.

4. Determine whether a pair of congruent polygons were produced by a slide.

*5. Determine one slide that is equivalent to the combination of two slides.

6. Determine the reflection (flip) image for any polygon when provided with the mirror line.

7. Determine the mirror line for a polygon and its mirror image.

8. Determine whether a pair of congruent figures were produced by a reflection.

*9. To determine the image after a combination of two reflections.

10. Obtain all the mirror symmetries for various polygons.

11. Obtain the rotation image for any polygon. (Limit: $\frac{1}{2}$, *$\frac{1}{4}$, *$\frac{3}{4}$, cw, ccw)

12. Fill in necessary requirements to complete diagrams for the motion of a turn.

13. Find the turn symmetries of a given figure.

*14. Determine the rotation image for any polygon after a combination of two turns.

15. Determine whether a pair of congruent figures were produced by a turn.

16. Complete an Invariance Table for the slide, reflection and one-half turn.

17. Classify polygons. (Limit: triangles, quadrilaterals, pentagons, hexagons, octagons, and decagons)

18. Using the number of lines of symmetry classify a triangle by its sides. (Note: Include traditional classification)

19. Classify quadrilaterals.

APPENDIX E

JUNIOR HIGH MATHEMATICS PERFORMANCE OBJECTIVES

LEVEL 8 January 21, 1977

UNIT I - SET THEORY

Students should be able to:

1. Maintain previously developed skills: terminology and Venn diagrams that relate to the development of Number Systems (Set, Subset, Finite, Infinite Sets, Universal Set, Equal Sets, Equivalent Sets, Empty or Null Sets).
2. Tabulate Union and Intersection. (Limit: 3 sets and universe),
3. Illustrate Union and Intersection using Venn diagrams. (Limit: 3 sets).

UNIT II - MEASUREMENT

A. Linear Measure

Students should be able to:

1. Maintain previously developed skills: SI units of length, convert SI to SI.

B. Area Measure

Students should be able to:

1. Define area measure as the number of unit squares a region contains.
2. Express measure of area correctly by including numeral and unit.
3. List the SI prefixes and explain how to use them with the SI units of area to designate smaller and larger units of area.
   (Limit: mm^2, cm^2, dm^2, m^2, dam^2, hm^2, km^2)
4. Convert from one unit of measure to another.
   (Limit: mm^2, cm^2, m^2, km^2, ha)
5. Perform the operations of addition, subtraction, multiplication, and division with units of measure.

APPENDIX E

JUNIOR HIGH MATHEMATICS PERFORMANCE OBJECTIVES

LEVEL 9

January 21, 1977

UNIT I - RATIONAL NUMBERS

Students should be able to:

1. Maintain previously developed skills: computation with rational numbers, convert fractions to decimals and decimals to fractions, application of properties (associative, commutative, distributive, additive inverse, multiplicative inverse, difference property, quotient property, zero property, identity element, closure property), evaluate expressions, order of expressions, percent.

*2. Convert repeating decimals to fractions.

3. Solve and verify conditions for equality and inequality.

    (a) $A + x = B$

    (b) $Ax = B$

    (c) $Ax + B = C$

    (d) $\frac{X}{A} = \frac{B}{C}$

    (e) $A(x + B) = C$

    (f) $Ax + Bx = C$

    (g) $Ax + B = Cx + D$

    *(h) $A(x + B) + Cx = D$

    *(i) $A(x + B) + C(x + D) = E$

    *(j) $\frac{x + A}{B} = \frac{x + C}{D}$

    *(k) $\frac{A}{B}x + \frac{C}{D} = E$

    *(l) $A(x + B) = C(x + D)$

    Note: Emphasis should be placed on conditions of the type (a) - (g).

4. Graph the solution set for inequalities on a number line.

5. Write word problems from given mathematical statements.

6. Write mathematical statements for given word problems.

7. (a) Solve problems which require the use of a formula.
    ($d = rt$, $c = np$, $a = \frac{t}{n}$, $s = c + o + p$, $i = prt$)

    (b) Solve a variety of problems using a condition in which only one variable is involved.

UNIT II - GEOMETRY

Students should be able to:

1. Maintain previously developed skills and ideas: classification of polygons: triangles, quadrilaterals, etc., congruent triangles and constructions.

2. Maintain previously developed skills and ideas: SI linear measure, SI area measure, express units in corresponding SI equivalents; perimeter and area formulas, problem solving.

3. Label triangles by using opposite vertices.

4. Demonstrate knowledge of the hypotenuse by labelling a triangle with a, b, and c where c stands for the hypotenuse.

5. State the Pythagorean Property.

6. State the formula $c^2 = a^2 + b^2$ for the Pythagorean Property.

*7. Determine which sets consisting of three elements are Pythagorean triads.

8. Use the Pythagorean Property to solve problems given diagrams and word problems.

9. Construct inscribed regular polygons: (Limit: triangle, square, hexagon, octagon, *pentagon.)

10. Develop the formula $A = \frac{1}{2}ans$ for finding the area of regular polygons and use the formula to solve problems.

11. Select the correct written description of right prisms, and regular pyramids.

12. Identify edges, faces, lateral faces, bases, apex, height and slant height, for right prisms and regular pyramids.

13. Determine a method for finding the surface area of a right prism.

14. Solve surface area problems for right prisms given diagrams and word problems.

15. Determine a method for finding the surface area of a right circular cylinder.

16. Solve surface area problems for cylinders given diagrams and word problems.

*17. Determine a method for finding surface area of a regular pyramid.

*18. Solve surface area problems for regular pyramids given diagrams and word problems.

19. Determine a method for finding the volume of a right prism.

20. Solve volume problems for right prisms given diagrams and word problems.

21. Determine a method for finding the volume of a right circular cylinder.

22. Solve volume problems for right circular cylinders given diagrams and word problems.

6. State that: (i) any motion or combination of motions is called a glide.
   (ii) an original and its image are congruent under a glide.

7. Define acute, obtuse and right angles.

8. Classify triangles by their angles.

9. Define the terms regular and diagonal as applied to polygons.

10. Classify quadrilaterals with respect to their diagonals.

11. Classify triangles by their sides.

12. Determine the properties of triangles using the lines of symmetry.

13. Show that the basic requirements for a pair of triangles to be congruent is one of the following: SSS, SAS, ASA.

14. Demonstrate that AAA is not a sufficient relationship to produce congruence.

15. Determine the angle sum of a triangle. (Glide the angles to become a line.)

16. Determine the angle sum of polygons.

17. Identify pairs of angles. (Limit: supplementary, complementary, linear, opposite, and adjacent.)

18. Determine the properties of the angles formed by two parallel lines and a transversal. (e.g. Use a slide and a half-turn.) (Limit: corresponding, alternate)

19. Develop a formula for the perimeter of any polygon. (e.g. P = sum of sidas.)

20. Sketch a required altitude given a triangle or a quadrilateral.

21. Develop the formula $A = ab$ for rectangles and squares.

22. Demonstrate that $A = ab$ is also the area formula for a parallelogram. (Glide one section to form a rectangle.) NOTE: Verbalize formula.

23. Demonstrate that $A = \frac{1}{2}ab$ is the area formula for a triangle. (Glide image to form a parallelogram.) NOTE: Verbalize formula.

24. Demonstrate that $A = \frac{1}{2}ab(b_1 + b_2)$ is the area formula for a trapezoid. (Glide image to form a parallelogram.) NOTE: Verbalize formula.

*25. Find the area of a region using Pick's Theorem.

26. Solve perimeter and area problems for various triangles and quadrilaterals given diagrams or word problems. (Recognize standard form of formulas; note the similarity between formulas and other conditions; solve for radius, length, etc.)

27. Determine the formula $C = \pi d$ for the circumference of a circle.
NOTE: Verbalize formula.

28. State the formula $A = \pi r^2$ for the area of a circle. NOTE: Verbalize formula.

29. Solve circumference and area problems for circles given diagrams or word problems.

30. Using the three motions construct the following:
    - (i) Perpendicular bisector of a line.
    - (ii) Perpendicular from a point to a line.
    - (iii) Angle bisector.
    - (iv) A parallel line through a given point, parallel to a given line.

31. Using a straight edge and compass construct the following:
    - (i) An equal segment
    - (ii) Equal angle
    - (iii) A perpendicular bisector of a line
    - (iv) A perpendicular from a given point to a line and a perpendicular to a given point or line
    - (v) An angle bisector
    - (vi) A parallel line through a given point, parallel to a given line
    - (vii) Equilateral, isosceles and scalene triangles
    - (viii) Angles of 90°, 45°, 60°, 30°, or a combination of the two.
    - * (ix) Triangles by SSS, SAS, ASA
    - * (x) "Family" of parallelograms

*32. Describe stripe patterns by means of line symmetry.

*33. Tile a plane.

UNIT IV - RATIONAL NUMBERS

A. Integers

Students should be able to:

1. Maintain previously developed skills: computational skills and order of operations with wholes, fractionals, and decimals: number system properties, identity elements and zero property.

2. Demonstrate the need for the integers. (e.g. $5 - 7 = x$)

3. Develop the integers using whole numbers and directed segments.

4. Compare the whole numbers and integers by plotting both sets on a number line.

5. Demonstrate use of identity elements and zero property. (De-emphasize terminology.)

6. State the additive inverse of any integer.

7. Perform the operation of addition with integers.

8. Apply the Difference Property in computation with integers. (e.g. $5 - 7 = 5 + {}^{-}7$)

9. Perform the operations of multiplication and division with integers.

10. Evaluate integral expressions by using the properties to produce short cuts in the computation. (De-emphasize terminology.)

    e.g. $^{-}6 + {}^{+}4 + {}^{+}6 = n$

    $(^{-}6 + {}^{+}6) + {}^{+}4 = n$

    $0 + {}^{-}4 = n$

11. Order integral expressions by using $<$, $>$, $=$.

12. Demonstrate the relationship between integers, whole numbers, and fractionals using Venn diagrams.

B. Rational Numbers

Students should be able to:

1. Maintain previously developed skills: computation with fractional and decimal numerals.

2. Demonstrate the need for rational numbers. (e.g. $^{-}5 + 2 = x$)

3. Compare the rational numbers and integers using a number line.

4. Define rational numbers as the set of numbers which may be expressed in the form $\frac{a}{b}$ or as infinite repeating decimals.

5. Perform the operation of addition with rational numbers.

6. State the additive inverse of any rational number.

7. Apply the Difference Property in computation with rational numbers.

8. Perform the operation of multiplication with rational numbers.

9. State the multiplicative inverse reciprocal of any rational number.

B. 10. Apply the Quotient Property in computation with rational numbers.

11. Identify 0 and 1 as the identity elements for addition and multiplication in the rationals. (De-emphasize terminology.)

12. Convert fractions to decimals and decimals to fractions.

13. Evaluate expressions by using the properties to produce short cuts in computation. (De-emphasize terminology.)

14. Order rational expressions using <, >, =.

15. Demonstrate the relationship between rational numbers and other number systems. (e.g. natural numbers, whole numbers, fractional numbers, integers)

16. Evaluate expressions by substituting for the variable. (Limit: rational numbers.)

17. Use the sum property, positive and negative multiplier properties with rational expressions.

18. Solve conditions for equality and inequality. (Limit: a to d, rational numbers, e, f, g, h, integers.)

    (a) $A + x + B$
    (b) $Ax = B$
    (c) $Ax + B = C$
    (d) $\frac{x}{A} = \frac{B}{C}$
    (e) $Ax + Bx = C$
    (f) $A(x + B) = C$
    *(g) $Ax = Bx + C$
    *(h) $Ax + B = Cx + D$

19. Verify solutions of conditions by substitution.

20. Graph the solution set for conditions on a number line. (Limit: rational numbers.)

21. Write word problems from given mathematical statements.

22. Write mathematical statements from given word problems.

23. Solve problems.

UNIT V - RATES, RATIO & PERCENT

Students should be able to:

1. Maintain previously developed skills and ideas: change fractions to equivalent fractions whose denominator is 100. Express rates and ratios in the form $\frac{a}{b}$. Find the missing component.

2. Solve rate and ratio problems.
3. Convert fractions to percent.
4. Convert percent to fractions.
5. Convert decimals to percent.
6. Convert percent to decimals.
7. Solve percent problems.

UNIT VI - EXPONENTS

Students should be able to:

1. Use the terms base, power, exponent, squared, cubed and to the n^{th} power.
2. Write the expanded form of whole numerals and decimal numerals using exponential notation. (Limit: bases - whole numbers, exponents - whole numbers.)
3. Write the values for powers. (Limit: bases - rational numbers, exponents - whole numbers.)
4. Express negative exponents in terms of positive exponents and find the values of the powers. (Limit: bases - rational numbers, exponents, integers.)
5. Write the expanded form of decimal numerals using negative exponents.
6. Simplify and evaluate expressions using the following properties. (Limit: bases - rational numbers, exponents - integers.)
   (a) $x^a \times x^b = x^{a+b}$ (c) $x^a \times y^a$
   (b) $x^a \div x^b = x^{a-b}$ (d) $x^a \times x^b$

*7. Write variables as bases with power properties.

8. Write the squares of numbers from one through twenty and estimate the square roots of numbers less than 400.

9. Use tables to find squares and square roots.

*10. Calculate square roots using an algorithm.

11. Write any standard numeral in scientific notation.

12. Write any numeral in standard form given scientific notation.

APPENDIX E

JUNIOR HIGH MATHEMATICS PERFORMANCE OBJECTIVES

LEVEL 9 January 21, 1977

UNIT I - RATIONAL NUMBERS

Students should be able to:

1. Maintain previously developed skills: computation with rational numbers, convert fractions to decimals and decimals to fractions, application of properties (associative, commutative, distributive, additive inverse, multiplicative inverse, difference property, quotient property, zero property, identity element, closure property), evaluate expressions, order of expressions, percent.

*2. Convert repeating decimals to fractions.

3. Solve and verify conditions for equality and inequality.

   (a) $A + x = B$

   (b) $Ax = B$

   (c) $Ax + B = C$

   (d) $\frac{X}{A} = \frac{B}{C}$

   (e) $A(x + B) = C$

   (f) $Ax + Bx = C$

   (g) $Ax + B = Cx + D$

   *(h) $A(x + B) + Cx = D$

   *(i) $A(x + B) + C(x + D) = E$

   *(j) $\frac{x + A}{B} = \frac{x + C}{D}$

   *(k) $\frac{A}{B}x + \frac{C}{D} = E$

   *(l) $A(x + B) = C(x + D)$

   Note: Emphasis should be placed on conditions of the type (a) - (g).

4. Graph the solution set for inequalities on a number line.

5. Write word problems from given mathematical statements.

6. Write mathematical statements for given word problems.

7. (a) Solve problems which require the use of a formula.
   ($d = rt$, $c = np$, $a = \frac{t}{n}$, $s = c + o + p$, $i = prt$)

   (b) Solve a variety of problems using a condition in which only one variable is involved.

UNIT II - GEOMETRY

Students should be able to:

1. Maintain previously developed skills and ideas: classification of polygons: triangles, quadrilaterals, etc., congruent triangles and constructions.

2. Maintain previously developed skills and ideas: SI linear measure, SI area measure, express units in corresponding SI equivalents; perimeter and area formulas, problem solving.

3. Label triangles by using opposite vertices.

4. Demonstrate knowledge of the hypotenuse by labelling a triangle with a, b, and c where c stands for the hypotenuse.

5. State the Pythagorean Property.

6. State the formula $c^2 = a^2 + b^2$ for the Pythagorean Property.

*7. Determine which sets consisting of three elements are Pythagorean triads.

8. Use the Pythagorean Property to solve problems given diagrams and word problems.

9. Construct inscribed regular polygons: (Limit: triangle, square, hexagon, octagon, *pentagon.)

10. Develop the formula $A = \frac{1}{2}ans$ for finding the area of regular polygons and use the formula to solve problems.

11. Select the correct written description of right prisms, and regular pyramids.

12. Identify edges, faces, lateral faces, bases, apex, height and slant height, for right prisms and regular pyramids.

13. Determine a method for finding the surface area of a right prism.

14. Solve surface area problems for right prisms given diagrams and word problems.

15. Determine a method for finding the surface area of a right circular cylinder.

16. Solve surface area problems for cylinders given diagrams and word problems.

*17. Determine a method for finding surface area of a regular pyramid.

*18. Solve surface area problems for regular pyramids given diagrams and word problems.

19. Determine a method for finding the volume of a right prism.

20. Solve volume problems for right prisms given diagrams and word problems.

21. Determine a method for finding the volume of a right circular cylinder.

22. Solve volume problems for right circular cylinders given diagrams and word problems.

23. Determine a method for finding the volume of a regular pyramid.

24. Solve volume problems for regular pyramids given diagrams and word problems.

25. Determine a method for finding the volume of a right circular cone.

26. Solve volume problems for right circular cones given diagrams and word problems.

27. Given the formulas, solve surface area and volume problems for spheres.

UNIT III - EXPONENTS

Students should be able to:

1. Maintain previously developed skills and ideas: standard name of integral powers, use of exponents in expanded notation, power properties with integral powers and rational bases.

2. Develop the properties of powers with variable bases.

   (a) $x^a \times x^b = x^{a+b}$

   (b) $x^a \div x^b = x^{a-b}$

   (c) $(x^a)^b = x^{ab}$

   (d) $(xy)^a = x^a y^a$

3. Apply the necessary properties of powers in simplification of expressions.

   e.g. $(-2x)^3 = -8x^3$

   $(2x)^2 \times 2x = 2^2 \times 2 \times x^2 \times x = 8x^3$

   $\frac{4x^2y}{16xy} = \frac{x}{4}$

4. Write any decimal numeral in scientific notation.

5. Write any decimal number in standard form given scientific notation.

*6. Perform multiplication and division with numerals written in scientific notation.

*7. Solve problems using scientific notation.

UNIT IV - ALGEBRA

Students should be able to:

1. Identify constants, variables, terms, coefficients and factors in an expression.
2. Identify the polynomials as to monomial, binomial, and trinomial.
3. State the degree of a polynomial and write a polynomial in standard form. (Limit: one variable.)
4. Evaluate polynomials by substituting for the variable.
5. Identify like and unlike terms. (Similar terms.)
6. Find the sum and difference of monomials.
7. Find the sum of polynomials. (Limit: trinomials.)
8. Find the difference of polynomials. (Limit: trinomials.)
9. Find the product of monomials.
10. Find the quotient of monomials.
11. Find the product of a monomial and a polynomial.
12. Factor polynomials by using the G.C.F.
13. Find the product of two binomials of the form $(x + a)(y + b)$.

*14. Find the product of two polynomials of more than two terms.

15. Factor polynomials by grouping into pairs.
16. Find the product of two binomials of the form $(x + a)(x + b)$.
17. Factor trinomials in which the coefficient of the squared variable is one.
18. Write the product of $(a + b)^2$, and $(a + b)(a - b)$ and recognize as general cases.
19. Factor $a^2 + 2ab + b^2$, $a^2 - 2ab + b^2$, and $a^2 - b^2$ and recognize as general cases.
20. Find the product of two binomials of the form $(ax + b)(cx + d)$.

*21. Factor trinomials in which the coefficient of the squared variable is greater than one.

*22. Use long division to divide polynomials.

23. Define algebraic fractions as expressions of the form $\frac{a}{b}$ where a and b are polynomials, $b \neq 0$.

24. Simplify algebraic fractions by factoring and reducing.

*25. Find the non-meaningful replacements of an algebraic fraction.

*26. Perform the operations of multiplication and division with algebraic fractions.

*27. Perform the operations of addition and subtraction with algebraic fractions which have common denominators.

*28. Perform the operations of addition and subtraction with algebraic fractions which have different denominators.

UNIT V - COORDINATE PLANE

Students should be able to:

1. Identify quadrants, axes and origin on the coordinate plane.

2. Plot ordered pairs on the coordinate plane.

3. Graph relations and identify locus intercepts and constants.

   $(y = kx, \ y = kx^2, \ y = \frac{k}{x})$

UNIT VI - REAL NUMBERS

Students should be able to:

1. Demonstrate the need for the real numbers. (e.g. square root of perfect squares.)

   e.g. Solve $x^2 = 2$

2. Define irrational numbers as infinite non-repeating decimals that cannot be expressed in the form

   $$\frac{a}{b}, \text{ with } b \neq 0.$$

3. Define real numbers as all infinite decimals and/or as the union of rationals and irrationals.

4. Demonstrate the relationship between the real numbers and other number systems. (Wholes, integers, rationals.)

   e.g. Locate given numbers on a Venn diagram representing number systems.

*5. Plot rational numbers and irrational numbers on a number line.

DEPARTMENT OF RESEARCH AND EVALUATION
EDMONTON PUBLIC SCHOOL DISTRICT NO. 7

EVALUATION
OF THE
"IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS (JUNIOR HIGH MATHEMATICS CONSORTIUM) PROJECT"

FUNDED BY THE PLANNING AND RESEARCH BRANCH
ALBERTA EDUCATION

FEBRUARY, 1977

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IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

(JUNIOR HIGH MATHEMATICS CONSORTIUM)

EVALUATION

EVALUATION ABSTRACT

This study was undertaken to satisfy one of the objectives of an agreement between Alberta Education and a consortium of twenty school systems. The purpose of this study was to evaluate the mathematical appropriateness of the Junior High Mathematics Program course objectives and the suitability of the support material in assisting the teachers in reaching these objectives with their classes.

The course objectives and support materials were evaluated by means of data collected through examinations, interviews and questionnaires administered to thirty-seven volunteer pilot schools from throughout the consortium member systems.

The results of this study indicate that the course objectives are mathematically appropriate and that the support materials are suitable for the designed purposes.

CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. The majority of pilot schools had student populations of between 250 and 1000 students grouped heterogeneously in classes, with enrolments of between twenty and thirty students.

2. The majority of the pilot schools were organized to provide between four and six forty-five minute periods of mathematics instruction per week during a full year course.

3. The majority of the pilot teachers involved in the projects were experienced, well-trained junior high school mathematics teachers who felt satisfied in teaching mathematics.

4. The mathematical appropriateness of the course objectives must be decided in relation to the ability level of the students for whom they are intended.

5. The Consortium Junior High Mathematics Program objectives are mathematically appropriate for average and gifted students.

6. The Consortium Junior High Mathematics Program objectives are mathematically appropriate for slow learners at the grade seven level.

7. Pilot teachers' opinions were split but a majority indicated that the Consortium Junior High Mathematics Program objectives are mathematically appropriate for slow learners at the grade eight and nine levels with the exception of the following units:

   a) Geometry 8
   b) Rational Numbers 9
   c) Algebra 9

CONCLUSIONS AND RECOMMENDATIONS (Cont'd.)

A. CONCLUSIONS

8. The support materials provided to assist the teacher in reaching the objectives with his class were suitable for the designed purposes.

9. Teachers prefer to use a selection of mathematical materials rather than a single resource.

10. The Consortium Junior High Mathematics Program provided for alternate teaching strategies and may be viewed as self-contained with a minimum of external resources necessary.

11. The Consortium Junior High Mathematics Program provided assistance to teachers in unit planning, daily planning, test construction and student evaluation.

12. The Consortium Junior High Mathematics Program provided motivation and interest for average and gifted students.

13. The Consortium Junior High Mathematics Program provided limited motivation and interest for slow learners.

14. Additional mathematical material is necessary to satisfy the needs of slow learners.

15. Teachers received satisfaction from their involvement with the Consortium Junior High Mathematics Program.

CONCLUSIONS AND RECOMMENDATIONS (Cont'd.)

A. CONCLUSIONS

During the revision phase of the project, the following additional components were developed:

a) Labs

This component contains laboratory experiments through which students may discover mathematical concepts.

b) Transparency Masters

These provide demonstration models, sample problems and student notes.

c) Applications

This component provides material through which the mathematical objectives may be related to their applications in the modern world.

d) History

This section provides material through which the development of mathematics may be examined.

e) Basic Skills Supplement

This provides a set of developmental and motivational exercises for selected objectives which may be used with slow learners.

The addition of these components will provide for increased flexibility in the modes of instruction that may be employed, and the inclusion of the Basic Skills Supplement will increase the suitability of the Program for slow learners.

CONCLUSIONS AND RECOMMENDATIONS (Cont'd.)

B. RECOMMENDATIONS

1. The Junior High Mathematics Program should be authorized by the Department of Education for use in Alberta Schools.

2. As pilot teachers' opinions of the mathematical suitability of the program for slow learners and at ? the grade eight and nine levels were split, further study should be made after the distribution of the Basic Skills Supplement.

3. An evaluation of the additional components in the revised program should be undertaken. These include:
   a) Labs
   b) Transparency Masters
   c) Applications
   d) History
   e) Basic Skills Supplement

I. PURPOSE

The purposes of the study were to evaluate:

A. The Junior High Mathematics course objectives (Appendix A) with respect to their mathematical appropriateness.

B. The suitability of the support material in assisting the teacher in reaching these objectives with his class.

II. EVALUATION DESIGN

The evaluation of the mathematical appropriateness of the Junior High Mathematics Program course objectives and the suitability of the support material was carried out using questionnaires, interviews, pilot examinations and committees making subjective professional judgements.

The procedure used to collect data for the evaluation of the mathematical appropriateness of the course objectives through the use of objective ratings and corresponding success performance criteria was developed by the Department of Pupil Assessment, Edmonton Public School Board.

A. Sample Population

The pilot schools were divided into three geographic samples of similar size. The sample population is not a random selection as the evaluation had to rely on volunteers (Appendix B).

B. Evaluation Instruments and Committees

1. Pilot Examination

Three pilot examinations were administered in November, 1975, March, 1976, and June, 1976. The pilot examinations provided data for the evaluation of the appropriateness of the Junior High Mathematics course objectives. The examinations were prepared for each pilot sample by a group of teachers in Edmonton using items from the Edmonton Public School Board Test Item Bank, and items developed by teachers. Wherever possible each test contained at least three multiple choice items for each objective to be tested.

II. EVALUATION DESIGN (Cont'd.)

B. 2. Pilot Teacher Questionnaire (Appendix C)

The Pilot Teacher Questionnaire was administered to all pilot teachers during September, 1975. The questionnaire was designed to gather data on:

a) Pilot Schools - enrolment
  - organization structure for the instruction of mathematics

b) Pilot Teachers- professional training and experience

3. Pilot Teacher Unit Interview (Appendix D)

The Pilot Teacher Unit Interview was conducted with each pilot teacher at the conclusion of each unit. The purpose of this interview was to gather information regarding the opinions of pilot teachers with respect to:

a) The appropriateness of course objectives
b) The suitability of the various program components
c) Program format

4. Pilot Teacher End of Year Interview (Appendix E)

The Pilot Teacher End of Year Interview was conducted with each pilot teacher during June, 1976. This interview was designed to supply information with respect to pilot teachers' opinions regarding the complete program.

5. Performance Criteria Committee

The Performance Criteria Committee which met in October, 1975, consisted of teachers from Edmonton, Calgary and Leduc, an Edmonton parent, and an Edmonton consultant. The committee separated the objectives into four categories based on the following criteria (Appendix F):

a) Objectives Rated One
  - Mastery is essential to further progress
  - Essential to attain for every child
  - Overlearning is recommended

II. EVALUATION DESIGN (Cont'd.)

B. 5. b) Objectives Rated Two

- Highly important skills
- Prerequisite skills to further work
- Most students should master skills

c) Objectives Rated Three

- Desirable skills
- Important to attain for academic students
- Less important for non-academic students

d) Objectives Rated Four

- Enrichment or interest only topics
- Isolated topics
- Not prerequisite skills

After consultation with the Edmonton Public School Board Pupil Assessment Consultants, these ratings were translated into the following success performance criteria:

a) Objectives Rated One - the criterion was met if 70% of the students achieved at the 70% level

b) Objectives Rated Two - the criterion was met if 60% of the students achieved at the 70% level

c) Objectives Rated Three - the criterion was met if 50% of the students achieved at the 70% level

d) Objectives Rated Four - no criteria were set as these objectives were not tested.

6. Objective Appropriateness Committee

The Objective Appropriateness Committee which met in January, 1977, consisted of four Edmonton teachers and a consultant familiar with the objectives.

The committee determined the mathematical appropriateness of the program objectives using the performance criteria, results from the pilot examinations and the pilot teacher unit interview data.

II. EVALUATION DESIGN (Cont'd.)

C. Methods

1. Mathematical Appropriateness of Course Objectives

The mathematical appropriateness of the course objectives, defined as their suitability in meeting the needs of junior high school students as judged by their teachers, was determined by the Objective Appropriateness Committee by using data gathered from the Pilot Teachers Unit Interview, the results of the pilot examinations and the predetermined performance criteria.

a) Tested Objectives

Objectives with a success performance criteria of one, two or three were tested and were judged as having met the criterion if the following results were achieved on the pilot examinations:

Objectives Rated One:	70% of the students achieved at the 70% level
Objectives Rated Two:	60% of the students achieved at the 70% level
Objectives Rated Three:	50% of the students achieved at the 70% level.

If an objective met the predetermined success performance criterion and was judged suitable by the pilot teachers on the Pilot Teacher Unit Interview form it was deemed to be appropriate.

If an objective did not meet the performance criterion but was judged suitable by the pilot teachers or met the performance criterion but was judged unsuitable by the pilot teachers its appropriateness was determined by the Objective Appropriateness Committee.

b) Objectives Not Tested

The mathematical appropriateness of the course objectives with a performance criteria of four was determined by the Objective Appropriateness Committee by making use of the Pilot Teacher Unit Interview data.

II. EVALUATION DESIGN (Cont'd.)

C. Methods

2. Suitability of Support Material

The suitability of the support material to facilitate the teacher in instruction of the objective was evaluated by conducting an analysis of the data obtained from the Pilot Teacher Unit Interview and the Pilot Teacher End of Year Questionnaire.

III. DESCRIPTION OF THE SAMPLE

A. Pilot Schools and Classes

The following information on the pilot schools and classes was obtained on the Teachers' Background Questionnaire. The information relates to the following:

Size of School
Size of class
Grouping of students
Mathematics instruction time
School year organization

1. Size of School

A majority of the pilot teachers reported that they taught in schools with student populations between 250 and 1000. Only 2.25% of the pilot teachers taught in schools with less than 250 population. Two teachers did not respond which may indicate that they taught in schools of greater than 1000 student population.

TABLE III.A.1

DISTRIBUTION OF PILOT TEACHERS BY SIZE OF SCHOOL

N = 89

Size of School	Number of Teachers
Less than 150 students	2.25% (2)*
Between 150 and 250 students	5.62% (5)
Between 250 and 500 students	33.72% (30)
Between 500 and 1000 students	58.43% (52)

* Indicates the number of responses.

2. Class Enrolment

Pilot teachers were asked to indicate the actual size of their classes and the size that they felt classes should be. Over fifty-six percent indicated that their classes had an enrolment of between twenty-six and thirty students, and twenty-four percent indicated that their classes were over

A. 2.

thirty. A slight majority (52.22%) of pilot teachers indicated that classes should have an enrolment of between twenty-one and twenty-five, and over forty percent felt that classes should have enrolments of twenty or fewer students.

TABLE III.A.2

DISTRIBUTION OF ENROLMENT IN PILOT CLASSES

Class Enrolment	Actual N = 91	Should Be N = 90
Under 15	0	6.67% (6)
15 - 20	1.1% (1)	35.56% (32)
21 - 25	18.68% (17)	52.22% (47)
26 - 30	56.04% (51)	5.56% (5)
More than 30	24.18% (22)	0

3. Grouping of Students

Teachers were asked to describe the actual make up of their classes with respect to ability and to indicate what they felt was the best method of grouping. More than seventy percent indicated that their students were grouped heterogeneously and more than seventy percent indicated that students should be grouped homogeneously. Over six percent indicated different forms of grouping were used, such as: differentiated classes for slow learners, homogeneous grouping in grade nine, and heterogeneous grouping in grades seven and eight. Three teachers expressed no opinion as to the best method of grouping.

III. DESCRIPTION OF THE SAMPLE (Cont'd.)

TABLE III.A.3

DISTRIBUTION OF METHODS OF GROUPING STUDENTS FOR INSTRUCTION

Grouping Methods	Actual N = 91	Should Be N = 88
Homogenous	21.98% (20)	70.45% (62)
Heterogeneous	71.43% (65)	23.86% (21)
Other	6.59% (6)	5.68% (5)

A. 4. Mathematics Instruction Time

The pilot teachers were asked to indicate the amount of time (classes per week) devoted to the instruction of mathematics. The largest percentage (61.54%) of teachers instructed their classes for approximately five forty-minute periods per week, but the number of forty-minute periods per week ranged from four (8.79%) to seven (7.69%). Eighty percent of pilot teachers reported that the present time allotment per week for the instruction of mathematics was sufficient. One teacher expressed no opinion.

TABLE III.A.4(i)

DISTRIBUTION OF MATHEMATICS INSTRUCTION PER WEEK

N = 91

Mathematics Instruction Time	Number of Teachers
4 classes/40 minutes	8.79% (8)
5 classes/40 minutes	61.54% (56)
6 classes/40 minutes	8.79% (8)
7 classes/40 minutes	7.69% (7)
Other	13.19% (12)

TABLE III.A.4(ii)
SUFFICIENCY OF TIME ALLOTMENT

N = 90

Response Category	Number of Teachers
Too much time	1.11%
Sufficient time	80.00%
Not enough time	18.89%

A. 5. School Year Organization

The pilot teachers were asked to indicate the way in which the school year in their schools was organized (full-year course, semestered course, trimestered course) and to indicate their preference. A large majority (93.41%) taught a full-year course but an even larger majority indicated that they preferred a full-year course.

TABLE III.A.5
DISTRIBUTION OF COURSE DURATION

N = 91

Course Duration	Actual		Should Be	
Full Year	93.41%	(85)	95.6%	(87)
Semestered	5.49%	(5)	3.3%	(3)
Trimestered	1.1%	(1)	0	
Other	0		1.1%	(1)

III. DESCRIPTION OF THE SAMPLE (Cont'd.)

A. 6. Conclusion

The Pilot Teachers' Background Questionnaire indicates the following with regard to the pilot schools:

a) School Size
92.15% of the pilot schools have a student population between 250 and 1000 students.

b) Class Enrolment
74.72% of the pilot classes have an enrollment of between twenty and thirty students.

c) Grouping of Students
71.43% of the pilot classes were heterogeneously grouped.

d) Mathematics Instruction Time
79.12% of the pilot classes received from four to six forty-minute periods of instruction per week.

e) School Year Organization
93.41% of the pilot classes were taught a full year course.

III. DESCRIPTION OF THE SAMPLE (Cont'd.)

B. Pilot Teachers

The following information was obtained through the Teacher Background Questionnaire and relates to the following areas:

- Teaching experience
- Academic background
- Teachers' perception of their adequacy of preparation to teach mathematics
- Teachers' satisfaction with teaching mathematics
- Teachers' perception of the difficulty of curriculum development

1. Teaching Experience

Table III.B.1 indicates that the majority of the pilot teachers were experienced junior high mathematics teachers. Over sixty percent have taught junior high mathematics for over three years. Less than six percent of the pilot teachers were new to junior high school and less than fourteen percent were new to junior high mathematics.

TABLE III.B.1

DISTRIBUTION OF TEACHERS BY TEACHING EXPERIENCE

N = 91

Years of Experience	In Junior High School	In Junior High School Mathematics
No Experience	5.49% (5)	13.19% (12)
One Year	12.09% (11)	9.89% (9)
Two Years	9.89% (9)	8.79% (8)
Three Years	8.79% (8)	6.59% (6)
More than Three Years	63.74% (58)	61.54% (57)

III. DESCRIPTION OF THE SAMPLE (Cont'd.)

B. Pilot Teachers (Cont'd.)

2. Academic Background

A large majority of the pilot teachers had some university training in mathematics, with less than six percent having no university mathematics courses (Table III.B.2), and less than twenty-six percent having no mathematics curriculum and instruction courses (Table III.B.3).

TABLE III.B.2

DISTRIBUTION OF TEACHERS BY UNIVERSITY MATHEMATICS COURSES

N = 91

Number of Courses	Number of Teachers
None	5.49% (5)
1 - 3 courses	31.87% (29)
4 - 6 courses	25.27% (23)
7 - 9 courses	19.78% (18)
More than 9 courses	17.58% (16)

TABLE III.B.3

DISTRIBUTION OF TEACHERS BY NUMBER OF CURRICULUM AND INSTRUCTION COURSES

N = 91

Number of Courses	Number of Teachers
None	25.27% (23)
0.5 - 1 course	35.16% (32)
1.5 - 2 courses	19.78% (18)
2.5 - 3 courses	12.09% (11)
More than 3 courses	7.69% (7)

III. DESCRIPTION OF THE SAMPLE (Cont'd.)

B. Pilot Teachers (Cont'd.)

3. Teachers' Perception of Adequacy of Preparation to Teach Mathematics

Over ninety percent of the pilot teachers felt that they were adequately prepared to teach mathematics. Slightly over thirty-four percent judged themselves as "very well" prepared, and over sixteen percent felt that they were "extremely well" prepared to teach mathematics. Less than nine percent felt that they were less than adequately prepared, with 2.2% of the pilot teachers indicating that they were "very poorly" prepared.

TABLE III.B.4

DISTRIBUTION OF TEACHERS BY PERCEPTION OF ADEQUACY OF PREPARATION (TRAINING)

N = 91

Adequacy of Preparation	Number of Teachers	
Extremely well	16.48%	(15)
Very well	34.07%	(31)
Adequate	40.66%	(37)
Poorly	6.59%	(6)
Very poorly	2.2%	(2)

4. Teachers' Satisfaction with Teaching Mathematics

Over ninety-six percent of the pilot teachers indicated that they were satisfied with teaching mathematics, with over sixty-two percent indicating that they were "very satisfied". No one expressed dissatisfaction with teaching mathematics, and only 3.3% were undecided.

III. DESCRIPTION OF THE SAMPLE (Cont'd.)

B. Pilot Teachers (Cont'd.)

TABLE III.B.5

DISTRIBUTION OF TEACHERS BY SATISFACTION WITH TEACHING OF MATHEMATICS

N = 91

Response Category	Number of Teachers
Very Satisfied	62.64% (57)
Generally Satisfied	34.07% (31)
Undecided	3.3% (3)
Somewhat Dissatisfied	0%
Very Dissatisfied	0%

5. Teachers' Perception of the Difficulty of Development of Curriculum in Mathematics

Slightly over fifty-six percent of the pilot teachers felt that curriculum development in mathematics was "no more difficult than other subjects", with four percent suggesting that it was a "very easy task". Over twenty-three percent felt that curriculum development in mathematics was a "very difficult task". Two of the pilot teachers expressed no opinion by not responding to the question.

TABLE III.B.6

DISTRIBUTION OF TEACHERS BY PERCEPTION OF THE DIFFICULTY OF DEVELOPMENT OF CURRICULUM IN MATHEMATICS

N = 89

Response Category	Number of Teachers
A very easy task	4.49% (4)
No more difficult than others	56.18% (50)
More difficult	15.73% (14)
A very difficult task	23.60% (21)
Beyond my ability	0%

6. Conclusions

The Teachers' Background Questionnaire indicated that the majority of pilot teachers involved in the project were experienced, well-trained junior high school mathematics teachers who felt satisfied in teaching mathematics. In addition, most felt that the development of curriculum in mathematics was a difficult task but no more difficult than other curriculum development in other areas.

IV. MATHEMATICAL APPROPRIATENESS OF THE JUNIOR HIGH MATHEMATICS COURSE OBJECTIVES

The Junior High Mathematics Program was designed to serve the needs of students of varying abilities and the course objectives have been rated on this basis. Due to this, it was felt that the mathematical appropriateness of an objective could only be determined in relation to its rating,as an objective that may be appropriate for one student or group of students may not necessarily be appropriate for a student or group of students of different ability.

During October, 1975 the performance criteria committee set preliminary ratings for each of the course objectives which were used to set performance criteria. In January, 1977, following the pilot year, the appropriateness committee reviewed the objective ratings on the basis of the data received from the pilot schools.

Pilot teachers were asked on the Pilot Teacher Interview Form to indicate the suitability of the unit objectives for gifted students, average students, and slow learners. This data, (Tables IV.1, IV.2, and IV.3), performance criteria for each objective, (Rating, Appendix F), and the results of the pilot examinations were used by the appropriateness committee to determine the mathematical appropriateness of the course objectives.

TABLE IV.1

DISTRIBUTION OF PILOT TEACHERS' OPINIONS ON THE SUITABILITY OF JUNIOR HIGH MATHEMATICS PROGRAM OBJECTIVES FOR GIFTED STUDENTS

Grade	Unit	N	Very Suitable	Suitable	Not Suitable	No Response
7	Set Theory	43	33% (14)	47% (20)	18% (8)	2% (1)
7	Whole Numbers	38	24% (9)	60% (23)	8% (3)	8% (3)
7	Rational Numbers	23	39% (9)	43% (10)	9% (2)	9% (2)
7	Rate, Ratio & Percent	20	50% (10)	45% (9)	0% (0)	5% (1)
7	Measurement	19	37% (7)	58% (11)	0% (0)	5% (1)
7	Exponents*	7	29% (2)	71% (5)	0% (0)	0% (0)
7	Geometry	12	58% (7)	42% (5)	0% (0)	0% (0)
8	Set Theory	46	31% (14)	54% (25)	11% (5)	4% (2)
8	Measurement	38	45% (17)	45% (17)	8% (3)	2% (1)
8	Geometry	29	48% (14)	48% (14)	0% (0)	4% (1)
8	Rational Numbers	25	72% (18)	28% (7)	0% (0)	0% (0)
8	Rate, Ratio & Percent	21	67% (14)	28% (6)	0% (0)	5% ((1)
8	Exponents	18	83% (15)	17% (3)	0% (0)	0% (0)
9	Rational Numbers	39	49% (19)	46% (18)	0% (0)	5% (2)
9	Geometry	27	63% (17)	33% (9)	0% (0)	4% (1)
9	Exponents	32	69% (22)	31% (10)	0% (0)	0% (0)
9	Algebra	22	73% (16)	27% (6)	0% (0)	0% (0)
9	Coordinate Plane	16	50% (8)	50% (8)	0% (0)	0% (0)
9	Real Numbers*	4	100%(4)	0% (0)	0% (0)	0% (0)

* Optional Units

TABLE IV.2

DISTRIBUTION OF PILOT TEACHERS' OPINIONS ON THE SUITABILITY OF JUNIOR HIGH MATHEMATICS PROGRAM OBJECTIVES FOR AVERAGE STUDENTS

Grade	Unit	N	Very Suitable	Suitable	Not Suitable	No Response
7	Set Theory	43	37% (16)	61% (26)	2% (1)	0% (0)
7	Whole Numbers	38	34% (13)	58% (22)	3% (1)	5% (2)
7	Rational Numbers	23	22% (5)	74% (17)	0% (0)	4% (1)
7	Rate, Ratio & Percent	20	30% (6)	60% (12)	5% (1)	5% (1)
7	Measurement	19	27% (5)	68% (13)	0% (0)	5% (1)
7	Exponents*	6	71% (4)	29% (2)	0% (0)	0% (0)
7	Geometry	12	42% (5)	58% (7)	0% (0)	0% (0)
8	Set Theory	46	33% (15)	61% (28)	2% (1)	4% (2)
8	Measurement	38	29% (11)	58% (22)	11% (4)	2% (1)
8	Geometry	29	7% (2)	86% (25)	7% (2)	0% (0)
8	Rational Numbers	25	28% (7)	68% (17)	0% (0)	4% (1)
8	Rate, Ratio & Percent	21	48% (10)	52% (11)	0% (0)	0% (0)
8	Exponents	18	61% (11)	39% (7)	0% (0)	0% (0)
9	Rational Numbers	39	23% (9)	69% (27)	5% (2)	3% (1)
9	Geometry	27	41% (11)	55% (15)	0% (0)	4% (1)
9	Exponents	32	28% (9)	66% (21)	6% (2)	0% (0)
9	Algebra	22	27% (6)	68% (15)	5% (1)	0% (0)
9	Coordinate Plane	16	50% (8)	50% (8)	0% (0)	0% (0)
9	Real Numbers*	4	75% (3)	25% (1)	0% (0)	0% (0)

* Optional Units

TABLE IV.3

DISTRIBUTION OF PILOT TEACHERS' OPINIONS ON THE SUITABILITY OF JUNIOR HIGH MATHEMATICS PROGRAM OBJECTIVES FOR SLOW LEARNERS

Grade	Unit	N	Very Suitable	Suitable	Not Suitable	No Response
7	Set Theory	43	11% (5)	77% (33)	9% (4)	3% (1)
7	Whole Numbers	38	10% (4)	53% (20)	26% (10)	11% (4)
7	Rational Numbers	23	0% (0)	61% (14)	35% (8)	4% (1)
7	Rate, Ratio & Percent	20	10% (2)	85% (20	0% (0)	5% (1)
7	Measurement	19	5% (1)	69% (13)	21% (4)	5% (1)
7	Exponents*	6	0% (0)	100% (6)	0% (0)	0% (0)
7	Geometry	12	17% (2)	67% (8)	16% (2)	0% (0)
8	Set Theory	46	9% (4)	48% (22)	35% (16)	8% (4)
8	Measurement	38	8% (3)	42% (16)	48% (18)	2% (1)
8	Geometry	29	0% (0)	41% (12)	59% (17)	0% (0)
8	Rational Numbers	25	0% (0)	64% (16)	32% (8)	4% (1)
8	Rate, Ratio & Percent	21	9% (2)	86% (18)	5% (1)	0% (0)
8	Exponents	18	5% (1)	78% (14)	17% (3)	0% (0)
9	Rational Numbers	39	3% (1)	36% (14)	49% (19)	12% (5)
9	Geometry	27	7% (2)	52% (14)	37% (10)	4% (1)
9	Exponents	32	6% (2)	62% (20)	28% (9)	4% (1)
9	Algebra	22	4% (1)	18% (4)	64% (14)	14% (3)
9	Coordinate Plane	16	19% (3)	62% (10)	19% (3)	0% (0)
9	Real Numbers*	4	0% (0)	50% (4)	50% (4)	0% (0)

* Optional Units

IV. A. MATHEMATICAL APPROPRIATENESS OF LEVEL SEVEN OBJECTIVES

1. Set Theory

Tables IV.1, IV.2, and IV.3 indicate that eighty percent of the pilot teachers felt that the objectives were suitable for gifted students, ninety-eight percent felt that they were suitable for average students and eighty-eight percent felt that they were suitable for slow learners.

The appropriateness committee judged all of the unit objectives suitable as rated but recommended that objective five be made optional.

2. Whole Numbers

Eight-four percent of the pilot teachers felt that the objectives were suitable for gifted students (Table IV.1), ninety-two percent felt that they were suitable for average students (Table IV.2), and sixty-three percent felt that they were suitable for slow learners (Table IV.3).

The appropriateness committee recommended that the following objectives receive a change in rating:

a) Objective 1 from three to four
b) Objective 15c from three to one
c) Objective 15d from three to one.

The committee further recommended that the use of the terms with reference to the number system properties be de-emphasized at this level and that the use of the properties receive stress.

The unit objectives were judged appropriate with the recommended changes.

3. Rational Numbers

Eighty-two percent of the pilot teachers felt that the objectives were suitable for gifted students (Table IV.1), ninety-six percent felt that they were suitable for average students (Table IV.2), and sixty-one percent felt they were suitable for slow learners (Table IV.3).

The appropriateness committee recommended that the following objectives receive a change in rating:

a) Objective B5 from three to two
b) Objective B14 from three to four.

They also recommended that the terminology in Objectives B6, B11, and B14 be de-emphasized in favor of the use of the properties in computation.

The committee judged the unit objectives appropriate with the above changes in rating.

4. Rate, Ratio & Percent

The pilot teacher unit interview forms indicated that ninety-five percent of the pilot teachers felt that the objectives were suitable for gifted students (Table IV 1), ninety percent felt that they were suitable for average students (Table IV.2), and ninety-five percent felt that they were suitable for slow learners (Table IV.3).

The appropriateness committee judged the objectives of this unit appropriate with no rating changes.

5. Measurement

The objectives were judged suitable for gifted students by ninety-five percent of the pilot teachers (Table IV.1), suitable for average students by ninety-five percent (Table IV.2), and, suitable for slow learners by seventy-four percent (Table IV.3).

IV. A. MATHEMATICAL APPROPRIATENESS OF LEVEL SEVEN OBJECTIVES (Cont'd.)

5. Measurement ...

Due to a number of comments from pilot teachers and the progression towards metrication in Canada all reference to the British system of measurement was deleted by the revision committee.

The appropriateness committee judged the objectives of this unit appropriate with the deletion of the objectives related to the British system of measurement.

6. Exponents

As this unit was optional at the discretion of the teacher a very small return of interview forms was received. One hundred percent of those that responded felt that the unit was suitable for gifted students (Table IV.1), average students (Table IV.2), and slow learners (Table IV.3).

The committee judged the objectives of this unit appropriate with no changes.

7. Geometry

One hundred percent of the pilot teachers felt that the objectives from this unit were suitable for gifted (Table IV.1) and average students (Table IV.2). Eighty-four percent of the pilot teachers felt that the objectives were suitable for slow learners (Table IV.3).

The committee judged the objectives of this unit appropriate with no changes.

IV. B. MATHEMATICAL APPROPRIATENESS OF LEVEL EIGHT OBJECTIVES

1. Set Theory

Eighty-five percent of the pilot teachers indicated that the objectives were suitable for gifted students (Table IV.1), ninety-four percent felt that the objectives were suitable for average students (Table IV.2), and fifty-seven percent felt that the objectives were suitable for slow learners (Table IV.3).

Pilot teachers expressed the opinion that Objective 3 which deals with the illustration of union and intersection of sets and related problems, was too difficult. As this objective is rated as four, the appropriateness committee recommended no change and judged the objectives appropriate.

2. Measurement

Due to the comments of the pilot teachers and Canada's commitment to metrication the revision committee deleted all reference to the British system of measurement.

Ninety percent of the pilot teachers expressed the opinion that the objectives were suitable for gifted students (Table IV.1), eighty-seven percent indicated that they were suitable for average students (Table IV.2), and five percent felt that the objectives were suitable for slow learners (Table IV.3). The forty-eight percent that indicated that the objectives were not suitable for slow learners made the following comments:

a) British units should be deleted (5)

b) Objective B1 to B7 too difficult (6)

c) Operations on units of measure too difficult to comprehend (5)

d) Algebraic method of area unit conversion beyond comprehension (2)

In addition, numerous pilot teachers suggested that Section C, angular measure, should be relocated in the Geometry unit.

2. Measurement ...

The appropriateness committee agreed with the deletion of the objectives related to the British system and the suggestion to relocate the angular measure objectives. They considered the concerns with regard to the conversion of area units but considering the ratings assigned to those objectives judged them and the rest of the unit appropriate.

3. Geometry

Ninety-six percent and ninety-three percent of the pilot teachers felt that the objectives were suitable for gifted students (Table IV.1), and average students (Table IV.2). Only forty-one percent of the teachers felt that the objectives were suitable for slow learners (Table IV.3). The fifty-nine percent who felt that the objectives were not suitable for slow learners indicated the following concerns:

a) To adequately teach this to slow learners requires a great deal of time (1)

b) Pick's theorem not suitable (3)

c) Students require an extensive review of grade seven work (3)

d) Objective on requirements for congruence of triangles - students had difficulty abstracting (2)

e) The properties of slides, turns, and reflections not adequate (1)

f) The slower students in the class tend to get lost in the content of the material. Area formulas and problem solving present a problem as well as adaptation of construction geometry (1)

g) Numerous objectives too difficult and as a result lack of interest and motivation (1)

h) Slow learners could not cope with all the definitions and the area and perimeter problems.

2. Geometry ...

The appropriateness committee recommended the following changes in rating:

a) Objective 5(i) from three to four
b) Objective 13 from four to three
c) Objective 14 from four to three

After considering the ratings of the objectives about which the concerns were expressed, the appropriateness committee judged all of the objectives appropriate with the exception of former Objective 18, "Use motions to prove two lines parallel", which they recommended be deleted as this objective is adequately covered in objectives two through four which deal with the properties of motions.

3. Rational Numbers

One hundred percent of the pilot teachers indicated that the objectives were suitable for gifted students (Table IV.1), ninety-six percent felt that the objectives were suitable for average students (Table IV.2) and sixty-four percent felt that the objectives were suitable for slow learners, (Table IV.3).

The appropriateness committee made the following recommendations for changes in the rating, stress or wording of the objectives:

a) Objective 22 - change rating from two to three
b) Objectives A5, A10, B11 and B13 - de-emphasize terminology and emphasize the use of the properties
c) Objective B18 - change the limit for B18(e) to integers
d) Objective B23 - rewrite the objective as "solve problems".

The unit objectives were judged appropriate with the recommended changes.

IV. B. MATHEMATICAL APPROPRIATENESS OF LEVEL EIGHT OBJECTIVES (Cont'd.)

4. Rate, Ratio & Percent

The pilot teacher unit interview forms indicated that ninety-five percent of the pilot teachers judged the objectives to be suitable for gifted students (Table IV.1), one hundred percent felt that the objectives were suitable for average students (Table IV.2), and ninety-five percent felt that the objectives were suitable for slow learners (Table IV.3).

The appropriateness committee judged the objectives appropriate with no changes.

5. Exponents

One hundred percent of the pilot teachers judged the objectives suitable for gifted students (Table IV.1) and average students (Table IV.2). Eighty-four percent felt that the objectives were suitable for slow learners (Table IV.3).

The appropriateness committee recommended that:

a) Objective 6(a) change rating from one to two
b) Objective 6(b) change rating from one to two

The unit objectives were judged suitable with the recommended changes.

IV. C. MATHEMATICAL APPROPRIATENESS OF LEVEL NINE OBJECTIVES

1. Rational Numbers

Ninety-five and ninety-two percent of the pilot teachers indicated that the objectives were suitable for gifted (Table IV.1) and average students (Table IV.2). Only thirty-nine percent indicated that the objectives were suitable for slow learners (Table IV.3). Those who indicated that the objectives were not suitable for slow learners reported the following concerns:

a) Objectives too difficult:

Objective 1	(2)
Objective 2	(2)
Objective 3	(9)
Objective 5	(3)
Objective 6	(5)
Objective 7	(10)

b) Computation section suitable, equations and problems not suitable (1)

The appropriateness committee recommended that the rating of Objective 7b be changed from three to four. The committee felt that the concerns reported were valid but that when considering the rating of the unit objectives they should be judged appropriate.

2. Measurement

On the basis of concerns reported by pilot teachers and the recommendations of the revision committee the measurement unit at Level 9 was deleted. Important concepts and prerequisite skills were included with the Geometry unit.

3. Geometry

Ninety-six percent of the pilot teachers felt that the objectives were suitable for gifted students (Table IV.1) and average students (Table IV.2). Fifty-nine percent felt that the objectives were suitable for slow learners (Table IV.3).

The appropriateness committee judged the unit objectives appropriate with the given ratings and recommended changes.

4. Exponents

The objectives were judged suitable for gifted students by one hundred percent (Table IV.1) of the pilot teachers, suitable for average students by ninety-four percent (Table IV.2) and suitable for the slow learners by sixty-eight percent (Table IV.3).

The objectives were judged appropriate by the committee with no changes.

5. Algebra

One hundred percent of the pilot teachers judged the objectives suitable for gifted students (Table IV.1)and ninety-five percent judged them suitable for average students (Table IV.2). Sixty-four percent of the pilot teachers judged the objectives not suitable for slow learners and reported the following (Table IV.3):

a) Objectives 10 to 29 far too difficult (6)

b) Eliminate the objectives which require a high degree of abstraction (1)

c) Alternate work should be available in place of objectives dealing with factoring (1).

The appropriateness committee recommended a change in rating for Objective 1 from one to two. The objectives were judged appropriate with the recommended change.

6. Co-ordinate Plane

One hundred percent of the pilot teachers reported that the objectives were suitable for gifted (Table IV.1) and average students (Table IV.2). Eighty-one percent of the pilot teachers judged the objectives suitable for slow learners (Table IV.3).

The committee judged the objectives appropriate with no changes in rating.

IV. C. MATHEMATICAL APPROPRIATENESS OF LEVEL NINE OBJECTIVES (Cont'd.)

7. Real Numbers

Few returns were received on this unit as it is optional at the discretion of the teacher. Of those teachers who reported, one hundred percent felt that the objectives were suitable for gifted students (Table IV.1), seventy-five percent felt that the objectives were suitable for average students (Table IV.2), and fifty percent judged them suitable for slow learners (Table IV.3).

The committee judged the objectives appropriate with no change in rating.

D. CONCLUSIONS

1. All of the objectives were judged suitable for gifted and average students by a large majority of the pilot teachers.

2. The suitability of the course objectives for slow learners decreased as the grade level increased.

3. A majority of the pilot teachers who responded judged the following units as "not suitable" for slow learners:
   a) Geometry 9
   b) Rational Numbers 9
   c) Algebra 9

4. The appropriateness committee judged the course objectives mathematically appropriate in relation to the objective ratings.

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL

The Junior High Mathematics Program Material was evaluated as to its suitability in facilitating the teachers in the instruction of the objectives. Data for this evaluation was gathered by the Pilot Teacher Unit Interview forms and the Pilot Teacher End of Year Questionnaire. Pilot teachers were asked to indicate which materials they used and their opinion as to the suitability.

A. Limit of the Study

Although the agreement with the Department of Education had a duration of two calendar years it contained only one school year. This required that the pilot and revision stages be carried out concurrently. Thus, only those program components that were parts of the original program have been evaluated. These components were:

1. The Prescription Sheets (Cross-Reference Manual)
   An index of textbook references in which the development of an objective or related exercises were to be found.
2. The Activities
   Teacher-made activities which were designed to be instructional and motivational.
3. The Learning Package
   Suggested developments and student exercises designed to assist the teacher in the instruction of an objective or group of objectives.

During the revision stage of the project additional components were added to the program to further facilitate the teaching of the course objectives. These additional components are:

a) The Labs Section
   Provides laboratory experiments through which students may discover mathematical concepts.

b) The Transparency Masters
   Provide demonstration models sample problems and student notes.

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

A. Limit of the Study

c) The Applications Section

Provides material through which the mathematical objectives may be related to their applications in the modern world.

d) The History Section

Provides material through which the development of mathematics may be examined.

e) Basic Skills Supplement

Provides a set of interesting motivational exercises for selected objectives.

B. Use of Material

Table V.B.1 indicates the distribution of pilot teachers by the material that they chose to use. Over 90% of the teachers in each of the three grades chose to use the Learning Package in conjunction with one or the other components.

The pilot teacher unit interview forms indicate a decrease in the use of the prescription sheets in later units in each grade. Numerous pilot teacher comments indicate a growing preference for the learning package as the major source of material. This recognition of the adequacy of the learning package is indicated as the main reason for the decrease in the use of the prescription sheets.

Lack of time was the reason most often given for teacher decision not to use the Activities.

TABLE V.B.1

DISTRIBUTION OF TEACHERS BY MATERIAL USED

Grade	Unit	N	Prescription Sheets	Activities	Learning Package
7	Set Theory	43	63% (27)	44% (19)	93% (40)
7	Whole Numbers	38	55% (21)	45% (17)	100% (38)
7	Rational Numbers	23	56% (13)	22% (5)	96% (22)
7	Rate, Ratio & Percent	20	40% (8)	30% (6)	100% (20)
7	Measurement	19	47% (9)	47% (9)	95% (18)
7	Exponents*	7	57% (4)	57% (4)	100% (7)
7	Geometry	12	25% (3)	33% (4)	100% (12)
	Mean Use Percent:		49%	40%	99%
8	Set Theory	46	54% (25)	28% (13)	96% (44)
8	Measurement	38	34% (13)	34% (13)	95% (36)
8	Geometry	29	38% (11)	34% (10)	100% (29)
8	Rational Numbers	25	56% (14)	40% (10)	100% (25)
8	Rate, Ratio & %	21	57% (12)	38% (8)	90% (19)
8	Exponents	18	44% (8)	28% (5)	100% (18)
	Mean Use Percent:		47%	34%	97%
9	Rational Numbers	39	31% (12)	21% (8)	100% (39)
9	Geometry	27	26% (7)	26% (7)	96% (26)
9	Exponents	32	28% (9)	9% (3)	100% (32)
9	Algebra	22	41% (9)	18% (4)	91% (20)
9	Coordinate Plane	16	25% (4)	50% (8)	88% (14)
9	Real Numbers*	4	50% (2)	0 (0)	75% (3)
	Mean Use Percent:		34%	21%	92%

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

C. Prescription Sheets (Cross-Reference Manual)

The prescription sheets provide teachers with a coded, annotated index of text development and exercise references to the course objectives. Each of the following texts was referenced:

Contemporary Mathematics 1
Contemporary Mathematics 2
Contemporary Mathematics 3

Mathematics Concepts Applications (First Course)
Mathematics Concepts Applications (Second Course)

Elementary Algebra

Exploring Modern Mathematics 1
Exploring Modern Mathematics 2
Exploring Modern Mathematics 3

Success with Mathematics 1
Success with Mathematics 2
Success with Mathematics 3

Those pilot teachers that used the prescription sheets were asked to indicate:

1) If they followed the suggested sequence of objectives
2) The adequacy of the text references
3) The suitability of the exercise coding
4) The value of the teacher notes

1. Objective Sequence

The percentage of pilot teachers who used the suggested sequence of objectives for each unit is reported in Table V.C.1.

TABLE V.C.1

DISTRIBUTION OF TEACHERS WHO USED THE SUGGESTED OBJECTIVE SEQUENCE (PRESCRIPTION SHEETS)

Grade	Unit	N	Number of Teachers
7	Set Theory	27	89% (24)
7	Whole Numbers	21	90% (19)
7	Rational Numbers	13	84% (11)
7	Rate, Ratio & Percent	8	100% (8)
7	Measurement	9	89% (8)
7	Exponents*	4	75% (3)
7	Geometry	3	33% (1)
8	Set Theory	25	76% (19)
8	Measurement	13	54% (7)
8	Geometry	11	82% (9)
8	Rational Numbers	14	100% (14)
8	Rate, Ratio & Percent	12	100% (12)
8	Exponents	8	100% (8)
9	Rational Numbers	12	100% (12)
9	Geometry	7	100% (7)
9	Exponents	9	77% (7)
9	Algebra	9	67% (6)
9	Coordinate Plane	4	100% (4)
9	Real Numbers*	2	50% (1)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

C. 2. Adequacy of Referencing

Pilot teachers were asked to judge the adequacy of the text references for each of the program units. Of the nineteen units, only four received any negative responses. This constituted less than nine percent of the return.

TABLE V.C.2

DISTRIBUTION OF TEACHERS' OPINIONS OF THE ADEQUACY OF THE TEXT REFERENCES

Grade	Unit	N	Entirely Adequate	Somewhat Adequate	Not Adequate
7	Set Theory	27	48% (13)	48% (13)	4% (1)
7	Whole Numbers	21	43% (9)	52% (11)	5% (1)
7	Rational Numbers	13	62% (8)	38% (5)	0% (0)
7	Rate, Ratio & Percent	8	63% (5)	37% (3)	0% (0)
7	Measurement	9	44% (4)	56% (5)	0% (0)
7	Exponents*	4	100% (4)	0% (0)	0% (0)
7	Geometry	3	0% (0)	100% (3)	0% (0)
8	Set Theory	25	52% (13)	40% (10)	8% (2)
8	Measurement	13	54% (7)	38% (5)	8% (1)
8	Geometry	11	9% (1)	91% (10)	0% (0)
8	Rational Numbers	14	50% (7)	50% (7)	0% (0)
8	Rate, Ratio & Percent	12	33% (4)	67% (8)	0% (0)
8	Exponents	8	37% (3)	63% (5)	0% (0)
9	Rational Numbers	12	67% (8)	33% (4)	0% (0)
9	Geometry	7	86% (6)	14% (1)	0% (0)
9	Exponents	9	55% (5)	45% (4)	0% (0)
9	Algebra	9	55% (5)	45% (4)	0% (0)
9	Coordinate Plane	4	50% (2)	50% (2)	0% (0)
9	Real Numbers*	2	50% (1)	50% (1)	0% (0)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

C. 3. Coding of Exercises

The exercises referenced to the objectives were coded according to the level of difficulty using the following code:

I - Introductory Material

This code does not indicate that the exercise should be used to introduce a topic, but that the depth of coverage remains at the introductory level.

M - Maintenance or Average Material

All "M" coded exercises are basic core program material and the topics are treated in more depth than the introductory exercises.

E - Extension and Enrichment Materials

The references coded "E" indicate that the content goes beyond the basic core program.

Pilot teachers were asked to indicate the suitability of this coding for the text references. All of the pilot teachers using the prescription sheets found the exercise coding suitable except in the following units: Set Theory, Level 7 and Level 8, Geometry, Level 8.

TABLE V.C.3

DISTRIBUTION OF TEACHERS' OPINIONS OF THE SUITABILITY OF THE CODING OF EXERCISES

Grade	Unit	N	Very Suitable		Somewhat Suitable		Not Suitable	
7	Set Theory	27	52%	(14)	37%	(10)	11%	(3)
7	Whole Numbers	21	52%	(11)	48%	(10)	0%	(0)
7	Rational Numbers	13	38%	(5)	62%	(8)	0%	(0)
7	Rate, Ratio & Percent	8	13%	(1)	87%	(7)	0%	(0)
7	Measurement	9	11%	(1)	89%	(8)	0%	(0)
7	Exponents*	4	75%	(3)	25%	(1)	0%	(0)
7	Geometry	3	0%	(0)	100%	(3)	0%	(0)
8	Set Theory	25	40%	(10)	52%	(13)	8%	(2)
8	Measurement	13	77%	(10)	23%	(3)	0%	(0)
8	Geometry	11	9%	(1)	82%	(9)	9%	(1)
8	Rational Numbers	14	29%	(4)	71%	(10)	0%	(0)
8	Rate, Ratio & Percent	12	42%	(5)	58%	(7)	0%	(0)
8	Exponents	8	37%	(3)	63%	(5)	0%	(0)
9	Rational Numbers	12	50%	(6)	50%	(6)	0%	(0)
9	Geometry	7	71%	(5)	29%	(2)	0%	(0)
9	Exponents	9	55%	(5)	45%	(4)	0%	(0)
9	Algebra	9	45%	(4)	55%	(5)	0%	(0)
9	Coordinate Plane	4	25%	(1)	75%	(3)	0%	(0)
9	Real Numbers*	2	0%	(0)	100%	(2)	0%	(0)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

C. 4. Teachers' Notes

Pilot teachers were asked to indicate their opinion of the value of the teachers' notes. These notes provided additional explanation of the referenced material, suggestions for its uses and/or suggestions for supplementary material that could be used in conjunction with the text.

A majority of teachers indicated that the teachers' notes were of assistance.

TABLE V.C.4

DISTRIBUTION OF TEACHERS' OPINIONS OF THE VALUE OF THE TEACHERS' NOTES

Grade	Unit	N	Great Value	Some Value	No Value
7	Set Theory	27	41% (11)	59% (16)	0% (0)
7	Whole Numbers	21	43% (9)	52% (11)	5% (1)
7	Rational Numbers	13	15% (2)	77% (10)	8% (1)
7	Rate, Ratio & Percent	8	37% (3)	63% (5)	0% (0)
7	Measurement	9	44% (4)	56% (5)	0% (0)
7	Exponents*	4	25% (1)	75% (3)	0% (0)
7	Geometry	3	67% (2)	33% (1)	0% (0)
8	Sets	25	28% (7)	52% (13)	20% (5)
8	Measurement	13	23% (3)	77% (10)	0% (0)
8	Geometry	11	36% (4)	55% (6)	9% (1)
8	Rational Numbers	14	36% (5)	64% (9)	0% (0)
8	Rate, Ratio & Percent	12	50% (6)	50% (6)	0% (0)
8	Exponents	8	75% (6)	25% (2)	0% (0)
9	Rational Numbers	12	42% (5)	58% (7)	0% (0)
9	Geometry	7	86% (6)	14% (1)	0% (0)
9	Exponents	9	77% (7)	23% (2)	0% (0)
9	Algebra	9	11% (1)	67% (6)	22% (2)
9	Coordinate Plane	4	25% (1)	75% (3)	0% (0)
9	Real Numbers*	2	0% (0)	100% (2)	0% (0)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

D. ACTIVITIES

The activities section of the program provided classroom-tested teacher-developed activities designed for use with an objective or group of objectives.

Those pilot teachers who used the activities were asked to indicate:

1) the manner in which they used the activities
2) the suitability of the activities for the purpose used.

1. Use of Activities

The pilot teachers used the activities for more than one purpose. The major uses at Level 7 and Level 8 were as "post-lesson reinforcement" and "general maintenance of skills". At Level 9 the activities were used by pilot teachers for "general maintenance of skills" and as "enrichment material".

TABLE V.D.1

DISTRIBUTION OF MANNER OF USE OF ACTIVITIES BY TEACHERS

Grade	Unit	N	Post Lesson Reinforcement	Post Unit Review	Maintenance of Skills	Enrichment Materials	Motivational Materials	Other
7	Set Theory	19	63% (12)	21% (4)	47% (9)	21% (4)	32% (6)	26% (5)
7	Whole Numbers	17	65% (11)	35% (6)	76% (13)	29% (5)	41% (7)	0% (0)
7	Rational Numbers	5	40% (2)	40% (2)	100% (5)	60% (3)	40% (2)	0% (0)
7	Rate, Ratio & Percent	6	67% (4)	33% (2)	83% (5)	33% (2)	0% (0)	0% (0)
7	Measurement	9	100% (9)	33% (3)	67% (6)	22% (2)	56% (5)	0% (0)
7	Exponents*	4	100% (4)	25% (1)	25% (1)	25% (1)	0% (0)	0% (0)
7	Geometry	4	75% (3)	50% (2)	100% (4)	25% (1)	0% (0)	0% (0)
8	Set Theory	13	85% (11)	54% (7)	62% (8)	23% (3)	31% (4)	8% (1)
8	Measurement	13	62% (8)	15% (2)	46% (6)	23% (3)	23% (3)	0% (0)
8	Geometry	10	50% (5)	60% (6)	80% (8)	20% (2)	30% (3)	10% (1)
8	Rational Numbers	10	70% (7)	60% (6)	80% (8)	70% (7)	60% (6)	0% (0)
8	Rate, Ratio & Percent	8	63% (5)	50% (4)	75% (6)	38% (3)	0% (0)	0% (0)
8	Exponents	5	20% (1)	20% (1)	80% (4)	40% (2)	60% (3)	0% (0)
9	Rational Numbers	8	25% (2)	13% (1)	50% (4)	75% (6)	63% (5)	0% (0)
9	Geometry	7	71% (5)	14% (1)	57% (4)	57% (4)	43% (3)	0% (0)
9	Exponents	3	67% (2)	0% (0)	100% (3)	100% (3)	100% (3)	0% (0)
9	Algebra	4	50% (2)	100% (4)	100% (4)	50% (2)	25% (1)	0% (0)
9	Coordinate Plane	8	63% (5)	63% (5)	38% (1)	50% (4)	63% (5)	0% (0)
9	Real Numbers*	0	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

D. 2. Suitability of Activities

Pilot teachers were asked to indicate their opinion of the suitability of the activities for the purpose for which they were used. Table V.D.2 indicates that all but one of the teachers who used the activities judged them suitable for the chosen purpose.

TABLE V.D.2

DISTRIBUTION OF TEACHERS' OPINIONS OF THE SUITABILITY OF THE ACTIVITIES

Grade	Unit	N	Very Suitable	Somewhat Suitable	Not Suitable
7	Set Theory	19	58% (11)	37% (7)	5% (1)
7	Whole Numbers	17	65% (11)	35% (6)	0% (0)
7	Rational Numbers	5	40% (2)	60% (3)	0% (0)
7	Rate, Ratio & Percent	6	67% (4)	33% (2)	0% (0)
7	Measurement	9	89% (8)	11% (1)	0% (0)
7	Exponents*	4	100% (4)	0% (0)	0% (0)
7	Geometry	4	75% (3)	25% (1)	0% (0)
8	Set Theory	13	77% (10)	23% (3)	0% (0)
8	Measurement	13	38% (5)	62% (8)	0% (0)
8	Geometry	10	60% (6)	40% (4)	0% (0)
8	Rational Numbers	10	70% (7)	30% (3)	0% (0)
8	Rate, Ratio & Percent	8	100% (8)	0% (0)	0% (0)
8	Exponents	5	80% (4)	20% (1)	0% (0)
9	Rational Numbers	8	50% (4)	50% (4)	0% (0)
9	Geometry	7	57% (4)	43% (3)	0% (0)
9	Exponents	3	67% (2)	33% (1)	0% (0)
9	Algebra	4	100% (4)	0% (0)	0% (0)
9	Coordinate Plane	8	88% (7)	12% (1)	0% (0)
9	Real Numbers*	0	0% (0)	0% (0)	0% (0)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

E. LEARNING PACKAGE

The learning package provided teachers with suggested development(s) and student exercises for each objective around which a lesson could be planned. Pilot teachers were asked to indicate:

1) If they followed the suggested sequence of objectives.
2) To what extent they used the suggested development.
3) To what extent they found the suggested developments adequate.
4) To what extent they used the student exercises.
5) To what extent they found the student exercises to be adequate.

1. Objective Sequence

The percentages of pilot teachers who used the suggested sequence of objectives for each unit is reported in Table V.E.1.

TABLE V.E.1

DISTRIBUTION OF TEACHERS WHO USED THE SUGGESTED OBJECTIVE SEQUENCE

(LEARNING PACKAGE)

Grade	Unit	N	Number of Teachers
7	Set Theory	40	98% (39)
7	Whole Numbers	38	92% (35)
7	Rational Numbers	22	95% (21)
7	Rate, Ratio & Percent	20	95% (19)
7	Measurement	18	89% (16)
7	Exponents*	7	100% (7)
7	Geometry	12	100% (12)
8	Set Theory	44	100% (44)
8	Measurement	36	89% (32)
8	Geometry	29	79% (23)
8	Rational Numbers	25	96% (24)
8	Rate, Ratio & Percent	19	95% (18)
8	Exponents	18	94% (17)
9	Rational Numbers	39	95% (37)
9	Geometry	26	92% (24)
9	Exponents	32	88% (28)
9	Algebra	20	85% (17)
9	Coordinate Plane	14	93% (13)
9	Real Numbers*	3	100% (3)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

E. 2. Use of the Suggested Developments

Table V.E.2 indicates the extent to which pilot teachers used the suggested developments.

TABLE V.E.2

DISTRIBUTION OF TEACHERS' USE OF THE SUGGESTED DEVELOPMENTS

Grade	Unit	N	Great Extent		Limited Extent		Not Used	
7	Set Theory	40	67%	(27)	30%	(12)	3%	(1)
7	Whole Numbers	38	74%	(28)	26%	(10)	0%	(0)
7	Rational Numbers	22	77%	(17)	23%	(5)	0%	(0)
7	Rate, Ratio & Percent	20	65%	(13)	35%	(7)	0%	(0)
7	Measurement	18	72%	(13)	28%	(5)	0%	(0)
7	Exponents*	7	71%	(5)	29%	(2)	0%	(0)
7	Geometry	12	83%	(10)	17%	(2)	0%	(0)
8	Sets	44	50%	(22)	50%	(22)	0%	(0)
8	Measurement	36	56%	(20)	44%	(16)	0%	(0)
8	Geometry	29	69%	(20)	31%	(9)	0%	(0)
8	Rational Numbers	25	88%	(22)	12%	(3)	0%	(0)
8	Rate, Ratio & Percent	19	79%	(15)	21%	(4)	0%	(0)
8	Exponents	18	83%	(15)	17%	(3)	0%	(0)
9	Rational Numbers	39	64%	(25)	31%	(12)	5%	(2)
9	Geometry	26	58%	(15)	42%	(11)	0%	(0)
9	Exponents	32	66%	(21)	34%	(11)	0%	(0)
9	Algebra	20	70%	(14)	30%	(6)	0%	(0)
9	Coordinate Plane	14	50%	(7)	50%	(7)	0%	(0)
9	Real Numbers*	3	33%	(1)	67%	(2)	0%	(0)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

E. 3. Adequacy of the Suggested Development

Over ninety percent of the pilot teachers indicated that the suggested developments were adequate. In all but two units (Set Theory and Measurement, Level 8) over fifty percent of the teachers indicated that the suggested developments were adequate to a "Great Extent".

TABLE V.E.3

DISTRIBUTION OF TEACHERS' OPINIONS OF THE ADEQUACY OF THE SUGGESTED DEVELOPMENTS

Grade	Unit	N	Great Extent		Limited Extent		Not Adequate	
7	Set Theory	40	50%	(20)	48%	(19)	2%	(1)
7	Whole Numbers	38	55%	(21)	42%	(16)	3%	(1)
7	Rational Numbers	22	68%	(15)	32%	(7)	0%	(0)
7	Rate, Ratio & Percent	20	55%	(11)	40%	(8)	5%	(1)
7	Measurement	18	56%	(10)	44%	(8)	0%	(0)
7	Exponents*	7	57%	(4)	43%	(3)	0%	(0)
7	Geometry	12	67%	(8)	25%	(3)	8%	(1)
8	Set Theory	44	45%	(20)	55%	(24)	0%	(0)
8	Measurement	36	33%	(12)	64%	(23)	3%	(1)
8	Geometry	29	52%	(15)	45%	(13)	3%	(1)
8	Rational Numbers	25	60%	(15)	40%	(10)	0%	(0)
8	Rate, Ratio & Percent	19	74%	(14)	26%	(5)	0%	(0)
8	Exponents	18	83%	(15)	17%	(3)	0%	(0)
9	Rational Numbers	39	56%	(22)	41%	(16)	3%	(1)
9	Geometry	26	73%	(19)	27%	(7)	0%	(0)
9	Exponents	32	69%	(22)	28%	(9)	3%	(1)
9	Algebra	20	75%	(15)	25%	(5)	0%	(0)
9	Coordinate Plane	14	64%	(9)	36%	(5)	0%	(0)
9	Real Numbers	3	67%	(2)	33%	(1)	0%	(0)

* Optional Units

E. 4. Use of Student Exercises

Table V.E.4 indicates the extent to which pilot teachers used the student exercises in their classes. With the exception of Exponents and Real Numbers, Level 9, over eighty percent of the teachers indicated that they used the student exercises in their classes to a "Great Extent".

TABLE V.E.4

DISTRIBUTION OF TEACHERS' USE OF THE STUDENT EXERCISES

Grade	Unit	N	Great Extent		Limited Extent		Not Used	
7	Set Theory	40	95%	(38)	5%	(2)	0%	(0)
7	Whole Numbers	38	92%	(35)	8%	(3)	0%	(0)
7	Rational Numbers	22	95%	(21)	5%	(1)	0%	(0)
7	Rate, Ratio & Percent	20	90%	(18)	10%	(2)	0%	(0)
7	Measurement	18	94%	(17)	0%	(0)	6%	(1)
7	Exponents*	7	100%	(7)	0%	(0)	0%	(0)
7	Geometry	12	92%	(11)	8%	(1)	0%	(0)
8	Set Theory	44	91%	(40)	9%	(4)	0%	(0)
8	Measurement	36	86%	(31)	14%	(5)	0%	(0)
8	Geometry	29	93%	(27)	7%	(2)	0%	(0)
8	Rational Numbers	25	100%	(25)	0%	(0)	0%	(0)
8	Rate, Ratio & Percent	19	100%	(19)	0%	(0)	0%	(0)
8	Exponents	18	94%	(17)	6%	(1)	0%	(0)
9	Rational Numbers	39	87%	(34)	13%	(5)	0%	(0)
9	Geometry	26	96%	(25)	4%	(1)	0%	(0)
9	Exponents	32	50%	(16)	44%	(14)	6%	(2)
9	Algebra	20	100%	(20)	0%	(0)	0%	(0)
9	Coordinate Plane	14	86%	(12)	14%	(2)	0%	(0)
9	Real Numbers*	3	67%	(2)	33%	(1)	0%	(0)

* Optional Units

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

E. 5. Adequacy of Student Exercises

Table V.E.5 indicates that ninety percent or more of the pilot teachers found the student exercises adequate. Fifty percent or more of the teachers indicated that the exercises, in all units but Rate, Ratio & Percent, Level 7, and Measurement, Level 8, were adequate to a "Great Extent".

TABLE V.E.5

DISTRIBUTION OF TEACHERS' OPINIONS OF THE ADEQUACY OF THE STUDENT EXERCISES

Grade	Unit	N	Great Extent		Limited Extent		Not Adequate	
7	Set Theory	40	67%	(27)	33%	(13)	0%	(0)
7	Whole Numbers	38	63%	(24)	34%	(13)	3%	(1)
7	Rational Numbers	22	59%	(13)	36%	(8)	5%	(1)
7	Rate, Ratio & Percent	20	40%	(8)	50%	(10)	10%	(2)
7	Measurement	18	78%	(14)	22%	(4)	0%	(0)
7	Exponents*	7	100%	(7)	0%	(0)	0%	(0)
7	Geometry	12	67%	(8)	33%	(4)	0%	(0)
8	Set Theory	44	75%	(33)	18%	(8)	7%	(3)
8	Measurement	36	47%	(17)	47%	(17)	6%	(2)
8	Geometry	29	69%	(20)	21%	(6)	10%	(3)
8	Rational Numbers	25	68%	(17)	28%	(7)	4%	(1)
8	Rate, Ratio & Percent	19	84%	(16)	16%	(3)	0%	(0)
8	Exponents	18	72%	(13)	28%	(5)	0%	(0)
9	Rational Numbers	39	64%	(25)	33%	(13)	3%	(1)
9	Geometry	26	69%	(18)	31%	(8)	0%	(0)
9	Exponents	32	50%	(16)	44%	(14)	6%	(2)
9	Algebra	20	75%	(15)	25%	(5)	0%	(0)
9	Coordinate Plane	14	72%	(10)	21%	(3)	7%	(1)
9	Real Numbers*	3	67%	(2)	33%	(1)	0%	(0)

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

F. General Suitability of the Program

During the End-of-Year Interview, pilot teachers were asked to indicate their general reactions to the program. Data was gathered on opinions as to:

a) the assistance provided by the program in unit planning
b) the assistance provided by the program in daily planning
c) the assistance provided by the program in test construction
d) The assistance provided by the program in student evaluation
e) the self-containment of the program
f) the change in teacher work load due to the program
g) the provision for alternate teaching strategies within the program
h) the extent to which student motivation and interest were provided by the program
i) the extent to which pilot teachers found the program interesting to teach.

1. Unit Planning

Ninety-seven percent of the pilot teachers indicated that they found the program of value in unit planning (Table V.F.1).

TABLE V.F.1

DISTRIBUTION OF TEACHERS' OPINIONS AS TO ASSISTANCE OF THE PROGRAM IN UNIT PLANNING

N = 93

Great Value	Some Value	Little Value	No Value	No Opinion
77% (72)	20% (18)	2% (2)	0% (0)	1% (1)
97% (90)		2% (2)		1% (1)

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

F. 2. Daily Planning

Ninety-nine percent of the pilot teachers reported that they found the program of assistance in daily planning.

TABLE V.F.2

DISTRIBUTION OF TEACHERS' OPINIONS AS TO ASSISTANCE OF PROGRAM IN DAILY PLANNING

N = 93

Great Value	Some Value	Little Value	No Value	No Opinion
77% (72)	22% (20)	1% (1)	0% (0)	0% (0)
99% (92)		1% (1)		0% (0)

3. Test Construction

Ninety-one percent of the pilot teachers reported that the program was of assistance in test construction.

TABLE V.F.3

DISTRIBUTION OF TEACHERS' OPINIONS AS TO ASSISTANCE OF PROGRAM IN TEST CONSTRUCTION

N = 93

Great Value	Some Value	Little Value	No Value	No Opinion
32% (30)	59% (55)	7% (6)	2% (2)	0% (0)
91% (85)		9% (8)		0% (0)

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

F. 4. Student Evaluation

Eighty-eight percent of the pilot teachers indicated that the program was of assistance in student evaluation. Two teachers did not respond.

TABLE V.F.4

DISTRIBUTION OF TEACHERS' OPINIONS AS TO ASSISTANCE OF PROGRAM IN STUDENT EVALUATION

N = 91

Great Value	Some Value	Little Value	No Value	No Opinion
26% (24)	62% (56)	10% (9)	1% (1)	1% (1)
88% (80)		11% (10)		1% (1)

5. Self-Containment

Ninety-nine percent of the pilot teachers felt that the program was self-contained to some extent. Seventy-four percent indicated that the program was mostly self-contained and ten percent felt that it was completely self-contained.

TABLE V.F.5

DISTRIBUTION OF TEACHERS' OPINIONS AS TO SELF-CONTAINMENT OF THE PROGRAM

N = 93

Completely	Mostly	Somewhat	Not At All	No Opinion
10% (9)	74% (69)	15% (14)	1% (1)	0% (0)
99% (92)			1% (1)	0% (0)

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

F. 6. Work Load

Eighty percent of the pilot teachers reported that the use of the program had some effect on their work load, fifty-one percent reported a decrease, and twenty-nine percent reported an increase. Twenty percent reported no change. Four teachers did not reply to the question.

TABLE V.F.6

DISTRIBUTION OF TEACHERS' OPINIONS AS TO THE PROGRAM'S EFFECT ON THEIR WORK LOAD

N = 89

Great Increase	Some Increase	No Change	Some Decrease	Great Decrease
7% (6)	22% (20)	20% (18)	41% (36)	10% (9)
29% (26)		20% (18)	51% (45)	

7. Alternate Teaching Strategies

The various program components were included in an attempt to provide teachers with an opportunity to vary their teaching strategies. Ninety-nine percent reported that the program provided this.

TABLE V.F.7

DISTRIBUTION OF TEACHERS' OPINIONS AS TO PROVISION FOR ALTERNATE TEACHING STRATEGIES

N = 93

Great Extent	Some Extent	Limited Extent	No Extent	No Opinion
9% (8)	76% (71)	14% (13)	1% (1)	0% (0)
99% (92)			1% (1)	0% (0)

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

F. 8. Interest and Motivation of Students

An attempt was made to design the activities and exercises in the program to be motivational and interesting for students. Table V.F.8, Page 55, indicates the pilot teachers' opinions as to the motivation and interest provided by the program.

(Table V.F.8 on Page 55)

9. Teacher Interest

Pilot teachers were asked to indicate the extent to which they found the program interesting to teach. Ninety-nine percent reported that teaching the program was interesting.

TABLE V.F.9

DISTRIBUTION OF TEACHERS' OPINIONS AS TO THE EXTENT TO WHICH THE PROGRAM WAS INTERESTING TO TEACH

N = 93

Great Extent	Some Extent	Limited Extent	No Interest	No Opinion
42% (39)	50% (47)	7% (6)	1% (1)	0% (0)
99% (92)			1% (1)	0% (0)

TABLE V.F.8

DISTRIBUTION OF TEACHERS' OPINIONS AS TO MOTIVATION AND INTEREST VALUE OF THE PROGRAM

N = 93

STUDENTS	MOTIVATION					INTEREST				
	Great	Some	Limited	None	No Opinion	Great	Some	Limited	None	No Opinion
Gifted	17% (16)	68% (63)	9% (8)	3% (3)	3% (3)	24% (22)	61% (57)	10% (9)	0% (0)	5% (5)
Average	16% (15)	75% (70)	8% (7)	0% (0)	1% (1)	27% (25)	64% (60)	8% (7)	0% (0)	1% (1)
Slow Learner	0% (0)	38% (35)	48% (45)	9% (8)	5% (5)	0% (0)	43% (40)	50% (46)	4% (4)	3% (3)

V. SUITABILITY OF THE JUNIOR HIGH MATHEMATICS PROGRAM MATERIAL (Cont'd.)

F. 10. Conclusion

The teachers found the program to be of value in assisting unit planning, daily planning, in test construction and in student evaluation. They found it almost self-contained. They indicated it provided for alternate teaching strategies and was of interest to average and gifted students, and also provided motivation for average and gifted students. They also found the program interesting to teach.

Provisions for interest and motivation for slow learners were seen as limited and opinions were split on whether the program decreased or increased the teacher's work load. One teacher who indicated an increase, however also pointed out that much of the increase may be attributed to the questionnaires and interviews that were to be completed for the pilot study.

The results indicated in Section 8 must be viewed with caution. A child considered "gifted" or "slow" in one class or program, may not be considered so in another class or program. "Slowness" may be defined by lack of interest or motivation.

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

APPENDIX A

JUNIOR HIGH MATHEMATICS PERFORMANCE OBJECTIVES

LEVEL 7

January 20, 1977

UNIT I - SET THEORY

Students should be able to:

1. Use symbols such as $\{\ \}$, $\in$, $\emptyset$, ... , when referring to sets.
2. Tabulate five sets from their everyday life.
   (Limit: five elements)
3. Select the sets that contain only the elements from a given universe.
4. List all the subsets, (including the empty set) for any given set.
   (Limit: four elements)

*5. Use Venn diagrams to represent a set and one of its subsets.

6. Determine from a list of sets which sets are equal.

*7. Determine from a list of sets which sets are equivalent.

8. Determine if a given set is finite or infinite.

UNIT II - WHOLE NUMBERS

Students should be able to:

1. Compare the set of whole numbers and the set of natural numbers by plotting both sets on a number line.
2. Demonstrate need for whole numbers (e.g. closure property).
3. Write any whole number in expanded form.
4. Write any whole number in standard form given the expanded form.
5. Perform the operations of addition and subtraction with whole numbers using the following terminology: addend, sum, difference, subtrahend, minuend.
6. Perform the operations of multiplication and division with whole numbers using the following terminology: multiplicand, multiplier, product, divisor, dividend, quotient.

* the asterisks indicate that these objectives are extensions of the core program

7. Use symbols and notation illustrated below.
   - a. Multiplication
     - (i) $3 \times 4 = (3)(4) = 3(40$
     - (ii) $3x = (3)(x) = 3(x)$
   - b. Division
     - (i) $\frac{9}{3} = 9 \div 3 = 3\overline{)\,9}$
     - (ii) $\frac{x}{9} = x \div 9 = 9\overline{)\,x}$

8. Demonstrate the use of identity elements and the zero property. (De-emphasize terminology)

9. Demonstrate that division by zero is undefined.

10. Evaluate an expression by using the properties to produce short cuts in the computation. (De-emphasize terminology)

    e.g. $4 \times 23 \times 25 = n$

    $100 \times 23 = n$

11. Evaluate expressions involving the order of operations. (Limit: Expressions of the type $7 + 5 - 4 - 3 \times 1 =$.)

12. Evaluate expressions by substituting for the variable. (Limit: Whole numbers and one variable.)

13. Solve conditions for equality using an informal approach for the following types. (Limits: Whole numbers.)

    a. $A + x = B$ c. $Ax + B = C$

    b. $Ax = B$ d. $Ax + Bx = C$

    Note: *Make sure you check the level of difficulty before having the students use an informal approach.*

14. Verify solutions of conditions by substitution.

15. Use some formalized approach to solving conditions. (e.g. flow charts, related number sentences.)

    a. $A + x = B$ c. $Ax + B = C$

    b. $Ax = B$ d. $Ax + Bx = C$

16. Write English sentences for mathematical sentences.

17. Write mathematical sentences for English sentences.

18. Solve problems using any organized approach.

UNIT III - RATIONAL NUMBERS

A. Factors and Multiples

Students should be able to:

1. Maintain all previously developed skills and ideas: primes, composites, factors, multiples, and divisibility.
2. List the set of factors for whole numbers. (Limit: 100)
3. Write the prime factorization for whole numbers. (Limit: 100)

*4. Obtain the G.C.F. for a set of four whole numbers. (Limit: 100)

*5. Obtain the L.C.M. for a set of four whole numbers. (Limit: 100)

*6. Determine if a pair of whole numbers is relatively prime. (e.g. prime factorization) (Limit: 100)

B. Fractional Numerals

Students should be able to:

1. Maintain previously developed skills and ideas: numerators, denominators, basic fractions, equivalent fractions, mixed numerals, improper fractions, and the order of fractions.
2. Demonstrate the need for fractional numbers. (e.g. solve conditions of the type $3x = 8$).
3. Recognize fractional numerals of the form $\frac{a}{b}$ as:
    - a. part of a whole
    - b. part of a group
    - c. a measure
    - d. a ratio
    - e. division

*4. Demonstrate that the whole numbers are a subset of the fractional numbers using Venn diagrams.

5. Demonstrate knowledge of the fractional numbers by plotting a given set on a number line.
6. Demonstrate the use of identity elements and the zero property. (De-emphasize terminology.)
7. Generate sets of equivalent fractions. (Limit: 5)

*8. Find the L.C.D. (e.g. using L.C.M.)

9. Reduce any fraction to its basic form. (e.g. using G.C.F.)

10. Perform the operations of addition and subtraction with fractional numbers. (Limit: 1 digit denominators.)

11. Demonstrate the use of reciprocals to obtain the identity element.

12. Perform the operations of multiplication and division with fractional numbers. (Limit: 1 digit denominators.)

13. Demonstrate that division by zero is undefined.

14. Evaluate an expression by using the properties to produce short cuts in computation. (De-emphasize terminology)

    e.g. $\frac{1}{2} + \frac{1}{4} + \frac{1}{2} = 1 + \frac{1}{4} = 1\frac{1}{4}$

15. Evaluate expressions involving order of operations.

    e.g. $(\frac{3}{4} \times \frac{4}{5} + \frac{6}{12} \div \frac{3}{4} =)$

16. Order fractional numerals using the symbols: < , >, = .

C. Decimals

Students should be able to:

1. Maintain previously developed skills and ideas: change fractions to decimals by use of equivalent fractions, place value to 1 000ths.

2. Write any decimal numeral in expanded form. (Use exponential notation only if previously taught).

3. Write any decimal numeral in standard form given expanded form. (Use exponential notation only if previously taught)

4. Order decimal numerals using the symbols < , >, = .

5. Demonstrate knowledge of decimals by plotting a given set on the number line. (Limit: 100th)

6. Perform operations of addition and subtraction with decimal numerals.

7. Round off decimal numerals. (Limit: 1 000ths)

8. Multiply and divide decimal numerals by powers of 10.

9. Perform operations of multiplication and division with decimal numerals.

10. Convert fractions to decimals by dividing the numerator by the denominator. (Limit: denominators of 100)

11. Convert decimals to fractions. (Limit: repeating zero and 3rds)

12. Use symbols and notation illustrated below. (Use fractions and decimals)

    a. Multiplication (i) $0.25 \times 0.1 = (0.25)(0.1)$

    (ii) $0.3y = (0.3)(y) = 0.3(y)$

    b. Division (i) $\frac{0.5}{0.4} = 0.5 \div 0.4 = 0.4\overline{)0.5}$ [illegible] $0.5(\frac{1}{0.4})$

    (ii) $\frac{0.2y}{0.5} = \frac{0.2}{0.5}y = 0.2 \div 0.5 =$ [illegible] (y)

13. Evaluate expressions by substituting for the variable. (Use fractions and decimals and one variable)

14. Solve the following types of conditions. (Use fractions and decimals)

    a. $A + x = B$
    b. $Ax = B$
    c. $Ax + Bx = C$
    d. $Ax + B = C$

15. Verify solutions of conditions by substitution.

16. Write English sentences for mathematical sentences.

17. Write mathematical sentences for English sentences.

18. Solve problems using an organized approach. (Use decimals and fractions)

UNIT IV - RATE, RATIO & PERCENT

Students should be able to:

1. Maintain previously developed skills and ideas: change fractions to an equivalent fraction whose denominator is 100.

2. Express rates, and ratios in the form $\frac{a}{b}$.

3. Find the missing component in any rate or ratio expressed in the equivalence condition form.

    e.g. $(\frac{3}{5} = \frac{x}{20})$

4. Solve problems involving rates and ratio.

*5. Convert fractions to percent.

*6. Convert percent to fractions.

*7. Convert decimals to percent.

*8. Convert percent to decimals.

*9. Solve problems involving percent.

UNIT V - MEASUREMENT

Students should be able to:

1. Explain measurement as a comparison to some unit.
2. State reasons as to why a standardized system of measurement is necessary.
3. Express measurements correctly by including the numeral and unit.
4. List the SI prefixes and explain what they mean, as well as the mathematical relationship that exists between each. (Limit: mm, cm, dm, m, dam, hm, km)
5. Convert SI units of length from one unit to another. (Limit: mm, cm, m, km)
6. Measure objects accurately using the SI units of length. (Limit: mm, cm, m)
7. Estimate the measure of various objects using the SI system and check by measuring.
8. Perform operations of addition and subtraction with SI units of measure.
9. Solve problems involving measurement.

*10. Write the standard units of mass and capacity in SI and use SI prefixes to generate larger and smaller units.

UNIT VI - EXPONENTS

Students should be able to:

*1. Use the terms base, power, exponent, square, and cube.

*2. Write the values for powers. (Limit: bases-whole, exponent-whole) Standard name of a power numeral.

*3. Use exponential notation to write the expanded form of whole and decimal numerals.

UNIT VII - GEOMETRY

Students should be able to:

1. Maintain previously developed skills and ideas: point, line, ray, segment, plane, space, and their symbols.

2. Determine whether two polygons or circles are congruent and name the corresponding congruent parts. (e.g. tracing)

3. Fill in the necessary requirements to complete the diagrams for the motion of a slide using correct correspondence notation.

4. Determine whether a pair of congruent polygons were produced by a slide.

*5. Determine one slide that is equivalent to the combination of two slides.

6. Determine the reflection (flip) image for any polygon when provided with the mirror line.

7. Determine the mirror line for a polygon and its mirror image.

8. Determine whether a pair of congruent figures were produced by a reflection.

*9. Determine the image after a combination of two reflections.

10. Obtain all the mirror symmetries for various polygons.

11. Obtain the rotation image for any polygon. (Limit: $\frac{1}{2}$, *$\frac{1}{4}$, *$\frac{3}{4}$, cw, ccw)

12. Fill in necessary requirements to complete diagrams for the motion of a trun.

13. Find the turn symmetries of a given figure.

*14. Determine the rotation image for any polygon after a combination of two turns.

15. Determine whether a pair of congruent figures were produced by a turn.

16. Complete an Invariance Table for the slide, reflection and one-half turn.

17. Classify polygons. (Limit: triangles, quadrilaterals, pentagons, hexagons, octagons, and decagons.)

18. Using the number of lines of symmetry, classify a triangle by its sides. (Note: Include traditional classification.)

19. Classify quadrilaters.

20. Determine the properties for parallelograms: square, rectangle and rhombus. (Motions make this very simple.)

(Limit: (i) opposite sides congruent
(ii) opposite angles congruent
(iii) opposite sides parallel
*(iv) diagonals bisect the figure
*(v) diagonals of a square and rhombus bisect each other
*(vi) diagonals of a square and rhombus are congruent
*(vii) diagonals of a square and rhombus are perpendicular)

21. Identify the parts of a circle. (Limit: interior, exterior, circle, center, radius, diameter, chord, arc, semi-circle, tangent and secant.)

22. Determine the properties of the circle. (Motions make this very simple.)

(Limit: (i) diameters bisect the circle
(ii) diameter equals two radii
(iii) the center is always equal distance from the circle)

*23. Use Motion Geometry to design wall paper.

*24. Use paper folding to produce stars and regular polygons.

JUNIOR HIGH MATHEMATICS PERFORMANCE OBJECTIVES

LEVEL 8 January 21, 1977

UNIT I - SET THEORY

Students should be able to:

1. Maintain previously developed skills: terminology and Venn diagrams that relate to the development of Number Systems (Set, Subset, Finite, Infinite Sets, Universal Set, Equal Sets, Equivalent Sets, Empty or Null Sets).
2. Tabulate Union and Intersection. (Limit: 3 sets and universe),
3. Illustrate Union and Intersection using Venn diagrams. (Limit: 3 sets).

UNIT II - MEASUREMENT

A. Linear Measure

Students should be able to:

1. Maintain previously developed skills: SI units of length, convert SI to SI.

B. Area Measure

Students should be able to:

1. Define area measure as the number of unit squares a region contains.
2. Express measure of area correctly by including numeral and unit.
3. List the SI prefixes and explain how to use them with the SI units of area to designate smaller and larger units of area.
   (Limit: mm^2, cm^2, dm^2, m^2, dam^2, hm^2, km^2)
4. Convert from one unit of measure to another.
   (Limit: mm^2, cm^2, m^2, km^2, ha)
5. Perform the operations of addition, subtraction, multiplication, and division with units of measure.

C. Angular Measure

Students should be able to:

1. Measure a given angle using a protractor and give its measure in degrees ($\pm 2^\circ$). (Limit: 180°).

2. Estimate the size of a given angle ($\pm 20^\circ$). (Limit: 180°).

3. Given the measure of an angle in degrees draw it using a protractor ($\pm 2^\circ$). (Limit: 180°).

UNIT III - GEOMETRY

Students should be able to:

1. Maintain previously developed skills: turn, slide, reflection, and classification of polygons.

2. State the properties of a slide.
   (Limit: (i) an original and image are congruent with respect to the whole figure as well as the various parts.
   (ii) line segment and image are parallel.
   (iii) line segments joining points and their images are congruent and parallel.)

3. State the properties of a turn.
   (Limit: (i) an original and its half-turn image are congruent with respect to the whole figure as well as the various parts.
   (ii) a line segment and its half-turn are parallel.
   (iii) a segment joining a point and its half-turn image is bisected by the turn center.)

4. State the properties of a reflection.
   (Limit: (i) an original and its reflection image are congruent with respect to the whole figure as well as the various parts.
   (ii) a point and its reflection image are the same distance from the mirror line.
   (iii) the mirror line is perpendicular to the line segment joining a point and its reflection image.)

5. State that:
   *(i) a slide reflection is a combination of a slide and a reflection.
   (ii) that an original and its image are congruent with respect to the whole figure as well as the various parts.

6. State that: (i) any motion or combination of motions is called a glide.
   (ii) an original and its image are congruent under a glide.

7. Define acute, obtuse and right angles.

8. Classify triangles by their angles.

9. Define the terms regular and diagonal as applied to polygons.

10. Classify quadrilaterals with respect to their diagonals.

11. Classify triangles by their sides.

12. Determine the properties of triangles using the lines of symmetry.

13. Show that the basic requirements for a pair of triangles to be congruent is one of the following: SSS, SAS, ASA.

14. Demonstrate that AAA is not a sufficient relationship to produce congruence.

15. Determine the angle sum of a triangle. (Glide the angles to become a line.)

16. Determine the angle sum of polygons.

17. Identify pairs of angles. (Limit: supplementary, complementary, linear, opposite, and adjacent.)

18. Determine the properties of the angles formed by two parallel lines and a transversal. (e.g. Use a slide and a half-turn.) (Limit: corresponding, alternate)

19. Develop a formula for the perimeter of any polygon. (e.g. P = sum of sides.)

20. Sketch a required altitude given a triangle or a quadrilateral.

21. Develop the formula $A = ab$ for rectangles and squares.

22. Demonstrate that $A = ab$ is also the area formula for a parallelogram. (Glide one section to form a rectangle.) NOTE: Verbalize formula.

23. Demonstrate that $A = \frac{1}{2}ab$ is the area formula for a triangle. (Glide image to form a parallelogram.) NOTE: Verbalize formula.

24. Demonstrate that $A = \frac{1}{2}ab(b_1 + b_2)$ is the area formula for a trapezoid. (Glide image to form a parallelogram.) NOTE: Verbalize formula.

*25. Find the area of a region using Pick's Theorem.

26. Solve perimeter and area problems for various triangles and quadrilaterals given diagrams or word problems. (Recognize standard form of formulas; note the similarity between formulas and other conditions; solve for altitudes, length, etc.)

27. Determine the formula $C = \pi d$ for the circumference of a circle. NOTE: Verbalize formula.

28. State the formula $A = \pi r^2$ for the area of a circle. NOTE: Verbalize formula.

29. Solve circumference and area problems for circles given diagrams or word problems.

30. Using the three motions construct the following:

    (i) Perpendicular bisector of a line.
    (ii) Perpendicular from a point to a line.
    (iii) Angle bisector.
    (iv) A parallel line through a given point, parallel to a given line.

31. Using a straight edge and compass construct the following:

    (i) An equal segment
    (ii) Equal angle
    (iii) A perpendicular bisector of a line
    (iv) A perpendicular from a given point to a line and a perpendicular to a given point or line
    (v) An angle bisector
    (vi) A parallel line through a given point, parallel to a given line
    (vii) Equilateral, isosceles and scalene triangles
    (viii) Angles of 90°, 45°, 60°, 30°, or a combination of the two.
    * (ix) Triangles by SSS, SAS, ASA
    * (x) "Family" of parallelograms

*32. Describe stripe patterns by means of line symmetry.

*33. Tile a plane.

UNIT IV - RATIONAL NUMBERS

A. Integers

Students should be able to:

1. Maintain previously developed skills: computational skills and order of operations with wholes, fractionals, and decimals: number system properties, identity elements and zero property.

2. Demonstrate the need for the integers. (e.g. $5 - 7 = x$)

3. Develop the integers using whole numbers and directed segments.

4. Compare the whole numbers and integers by plotting both sets on a number line.

5. Demonstrate use of identity elements and zero property. (De-emphasize terminology.)

6. State the additive inverse of any integer.

7. Perform the operation of addition with integers.

8. Apply the Difference Property in computation with integers. (e.g. $5 - 7 = 5 + {}^-7$)

9. Perform the operations of multiplication and division with integers.

10. Evaluate integral expressions by using the properties to produce short cuts in the computation. (De-emphasize terminology.)

    e.g. $^-6 + {}^+4 + {}^+6 = n$

    $(^-6 + {}^+6) + {+4} = n$

    $0 + {}^-4 = n$

11. Order integral expressions by using <, >, =.

12. Demonstrate the relationship between integers, whole numbers, and fractionals using Venn diagrams.

B. Rational Numbers

Students should be able to:

1. Maintain previously developed skills: computation with fractional and decimal numerals.

2. Demonstrate the need for rational numbers. (e.g. $^-5 \div 2 = x$)

3. Compare the rational numbers and integers using a number line.

4. Define rational numbers as the set of numbers which may be expressed in the form $\frac{a}{b}$ or as infinite repeating decimals.

5. Perform the operation of addition with rational numbers.

6. State the additive inverse of any rational number.

7. Apply the Difference Property in computation with rational numbers.

8. Perform the operation of multiplication with rational numbers.

9. State the multiplicative inverse (reciprocal) of any rational number.

B. 10. Apply the Quotient Property in computation with rational numbers.

11. Identify 0 and 1 as the identity elements for addition and multiplication in the rationals. (De-emphasize terminology.)

12. Convert fractions to decimals and decimals to fractions.

13. Evaluate expressions by using the properties to produce short cuts in computation. (De-emphasize terminology.)

14. Order rational expressions using <, >, =.

15. Demonstrate the relationship between rational numbers and other number systems. (e.g. natural numbers, whole numbers, fractional numbers, integers)

16. Evaluate expressions by substituting for the variable. (Limit: rational numbers.)

17. Use the sum property, positive and negative multiplier properties with rational expressions.

18. Solve conditions for equality and inequality. (Limit: a to d, rational numbers, e, f, g, h, integers.)

(a) $A + x = B$

(b) $Ax = B$

(c) $Ax + B = C$

(d) $\frac{x}{A} = \frac{B}{C}$

(e) $Ax + Bx = C$

(f) $A(x + B) = C$

*(g) $Ax = Bx + C$

*(h) $Ax + B = Cx + D$

19. Verify solutions of conditions by substitution.

20. Graph the solution set for conditions on a number line. (Limit: rational numbers.)

21. Write word problems from given mathematical statements.

22. Write mathematical statements from given word problems.

23. Solve problems.

UNIT V - RATES, RATIO & PERCENT

Students should be able to:

1. Maintain previously developed skills and ideas: change fractions to equivalent fractions whose denominator is 100. Express rates and ratios in the form $\frac{a}{b}$. Find the missing component.

2. Solve rate and ratio problems.

3. Convert fractions to percent.

4. Convert percent to fractions.

5. Convert decimals to percent.

6. Convert percent to decimals.

7. Solve percent problems.

UNIT VI - EXPONENTS

Students should be able to:

1. Use the terms base, power, exponent, squared, cubed and to the n^{th} power.

2. Write the expanded form of whole numerals and decimal numerals using exponential notation. (Limit: bases - whole numbers, exponents - whole numbers.)

3. Write the values for powers. (Limit: bases - rational numbers, exponents - whole numbers.)

4. Express negative exponents in terms of positive exponents and find the values of the powers. (Limit: bases - rational numbers, exponents, integers.)

5. Write the expanded form of decimal numerals using negative exponents.

6. Simplify and evaluate expressions using the following properties. (Limit: bases - rational numbers, exponents - integers.)
   (a) $x^a \times x^b = x^{a+b}$ (c) $x^a \times y^a$
   (b) $x^a \div x^b = x^{a-b}$ (d) $x^a \times x^b$

*7. Write variables as bases with power properties.

8. Write the squares of numbers from one through twenty and estimate the square roots of numbers less than 400.

9. Use tables to find squares and square roots.

*10. Calculate square roots using an algorithm.

11. Write any standard numeral in scientific notation.

12. Write any numeral in standard form given scientific notation.

APPENDIX A

JUNIOR HIGH MATHEMATICS PERFORMANCE OBJECTIVES

LEVEL 9 January 21, 1977

UNIT I - RATIONAL NUMBERS

Students should be able to:

1. Maintain previously developed skills: computation with rational numbers, convert fractions to decimals and decimals to fractions, application of properties (associative, commutative, distributive, additive inverse, multiplicative inverse, difference property, quotient property, zero property, identity element, closure property), evaluate expressions, order of expressions, percent.

*2. Convert repeating decimals to fractions.

3. Solve and verify conditions for equality and inequality.

   (a) $A + x = B$

   (b) $Ax = B$

   (c) $Ax + B = C$

   (d) $\frac{X}{A} = \frac{B}{C}$

   (e) $A(x + B) = C$

   (f) $Ax + Bx = C$

   (g) $Ax + B = Cx + D$

   *(h) $A(x + B) + Cx = D$

   *(i) $A(x + B) + C(x + D) = E$

   *(j) $\frac{x + A}{B} = \frac{x + C}{D}$

   *(k) $\frac{A}{B}x + \frac{C}{D} = E$

   *(l) $A(x + B) = C(x + D)$

   Note: Emphasis should be placed on conditions of the type (a) - (g).

4. Graph the solution set for inequalities on a number line.

5. Write word problems from given mathematical statements.

6. Write mathematical statements for given word problems.

7. (a) Solve problems which require the use of a formula.
   ($d = rt$, $c = np$, $a = \frac{t}{n}$, $s = c + o + p$, $i = prt$)

   (b) Solve a variety of problems using a condition in which only one variable is involved.

UNIT II - GEOMETRY

Students should be able to:

1. Maintain previously developed skills and ideas: classification of polygons: triangles, quadrilaterals, etc., congruent triangles and constructions.

2. Maintain previously developed skills and ideas: SI linear measure, SI area measure, express units in corresponding SI equivalents; perimeter and area formulas, problem solving.

3. Label triangles by using opposite vertices.

4. Demonstrate knowledge of the hypotenuse by labelling a triangle with a, b, and c where c stands for the hypotenuse.

5. State the Pythagorean Property.

6. State the formula $c^2 = a^2 + b^2$ for the Pythagorean Property.

*7. Determine which sets consisting of three elements are Pythagorean triads.

8. Use the Pythagorean Property to solve problems given diagrams and word problems.

9. Construct inscribed regular polygons: (Limit: triangle, square, hexagon, octagon, *pentagon.)

10. Develop the formula $A = \frac{1}{2}ans$ for finding the area of regular polygons and use the formula to solve problems.

11. Select the correct written description of right prisms, and regular pyramids.

12. Identify edges, faces, lateral faces, bases, apex, height and slant height, for right prisms and regular pyramids.

13. Determine a method for finding the surface area of a right prism.

14. Solve surface area problems for right prisms given diagrams and word problems.

15. Determine a method for finding the surface area of a right circular cylinder.

16. Solve surface area problems for cylinders given diagrams and word problems.

*17. Determine a method for finding surface area of a regular pyramid.

*18. Solve surface area problems for regular pyramids given diagrams and word problems.

19. Determine a method for finding the volume of a right prism.

20. Solve volume problems for right prisms given diagrams and word problems.

21. Determine a method for finding the volume of a right circular cylinder.

22. Solve volume problems for right circular cylinders given diagrams and word problems.

23. Determine a method for finding the volume of a regular pyramid.

24. Solve volume problems for regular pyramids given diagrams and word problems.

25. Determine a method for finding the volume of a right circular cone.

26. Solve volume problems for right circular cones given diagrams and word problems.

27. Given the formulas, solve surface area and volume problems for spheres.

UNIT III - EXPONENTS

Students should be able to:

1. Maintain previously developed skills and ideas: standard name of integral powers, use of exponents in expanded notation, power properties with integral powers and rational bases.

2. Develop the properties of powers with variable bases.

   (a) $x^a \times x^b = x^{a+b}$

   (b) $x^a \div x^b = x^{a-b}$

   (c) $(x^a)^b = x^{ab}$

   (d) $(xy)^a = x^a y^a$

3. Apply the necessary properties of powers in simplification of expressions.

   e.g. $(-2x)^3 = -8x^3$

   $(2x)^2 \times 2x = 2^2 \times 2 \times x^2 \times x = 8x^3$

   $\frac{4x^2y}{16xy} = \frac{x}{4}$

4. Write any decimal numeral in scientific notation.

5. Write any decimal number in standard form given scientific notation.

*6. Perform multiplication and division with numerals written in scientific notation.

*7. Solve problems using scientific notation.

UNIT IV - ALGEBRA

Students should be able to:

1. Identify constants, variables, terms, factors and numerical coefficients in an expression.
2. Identify the polynomial as to monomial, binomial, and trinomial.
3. State the degree of a polynomial and write a polynomial in standard form. (Limit: one variable.)
4. Evaluate polynomials by substituting for the variable.
5. Identify like and unlike terms. (Similar terms)
6. Find the sum and difference of monomials.
7. Find the sum of polynomials. (Limit: trinomials)
8. Find the difference of polynomials. (Limit: trinomials)
9. Find the product of monomials.
10. Find the quotient of monomials.
11. Find the product of a monomial and a polynomial.
12. Factor polynomials by using the greatest common factor.
13. Find the product of two binomials of the form $(x + a)(y + b)$.

*14. Find the product of two polynomials of more than two terms.

15. Factor polynomials by grouping into pairs.
16. Find the product of two binomials of the form $(x + a)(x + b)$.
17. Factor trinomials in which the coefficient of the squared variable is one.
18. Write the products of $(a + b)^2$, $(a - b)^2$, and $(a + b)(a - b)$, and recognize as general cases.
19. Factor $a^2 + 2\,ab + b^2$, $a^2 - 2ab + b^2$, and $a^2 - b^2$, and recognize as general cases.
20. Find the product of two binomials of the form $(ax + b)(cx + d)$.

*21. Factor trinomials in which the coefficient of the squared variable is greater than one.

*22. Use long division to divide polynomials.

23. Define algebraic fractions as expressions of the form $\frac{a}{b}$ where a and b are polynomials, $b \neq 0$.

24. Simplify algebraic fractions by factoring and reducing.

*25. Find the non-meaningful replacements of an algebraic fraction.

*26. Perform the operations of multiplication and division with algebraic fractions.

*27. Perform the operations of addition and subtraction with algebraic fractions which have common denominators.

*28. Perform the operations of addition and subtraction with algebraic fractions which have different denominators.

UNIT V - COORDINATE PLANE

Students should be able to:

1. Identify quadrants, axes and origin on the coordinate plane.

2. Plot ordered pairs on the coordinate plane.

3. Graph relations and identify locus intercepts and constants.

   $(y = kx, \quad y = kx^2, \quad y = \frac{k}{x})$

UNIT VI - REAL NUMBERS

Students should be able to:

1. Demonstrate the need for the real numbers. (e.g. square root of non-perfect squares.)

   e.g. Solve $x^2 = 2$

2. Define irrational numbers as infinite non-repeating decimals that cannot be expressed in the form

   $$\frac{a}{b}\text{, with } b \neq 0.$$

3. Define real numbers as all infinite decimals and/or as the union of rationals and irrationals.

4. Demonstrate the relationship between the real numbers and other number systems. (Wholes, integers, rationals.)

   e.g. Locate given numbers on a Venn diagram representing number systems.

*5. Plot rational numbers and irrational numbers on a number line.

APPENDIX B

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

PILOT SCHOOLS

			Pilot Students		
	School and Contact Person	*System*	*Grade 7*	*Grade 8*	*Grade 9*
	Sample A				
1.	Balwin J.H. School 7055-132 Avenue Edmonton, Alberta D. Darling	Edmonton Public School District #7	281	273	259
2.	Clover Bar J. H. School 50 Main Blvd. Sherwood Park, Alberta D. Holowach	County of Strathcona #20	120	175	160
3.	H.D. Cartwright School 5500 Dalhart Road Calgary, Alberta R. Kolochuk	Calgary School District #19	100	35	
4.	Milo School Box 99 Milo, Alberta P. Hamel	County of Vulcan #2	17		
5.	Olds J. H. School Box 298 Olds, Alberta T. Craven	Mountain View County #17	130	110	100
6.	Ponoka J.H. School Box 1299 Ponoka, Alberta E. Freeman	County of Ponoka #3		90	160
7.	St. Alphonsus J.H. School 928 Radnor Ave. N.E. Calgary, Alberta P. Chiasson	Calgary Roman Catholic Separate School District #1	130	100	100
8.	St. John's School Fort McMurray, Alberta B. Deslippe	Fort McMurray Roman Catholic Separate School District #12	104	120	65
9.	St. Philips J.H. School 144 Ave. & 92 Street Edmonton, Alberta J.J. Emslie	Edmonton Separate School District #7	90	120	72

			Pilot Students		
	School and Contact Person	*System*	*Grade 7*	*Grade 8*	*Grade 9*
10.	Senator Riley School High River, Alberta S. Kirk	Foothills School Division #38	66		
11.	Stratford J.H. School 8715-153 Street Edmonton, Alberta A. Brattberg	Edmonton Public School District #7	153	165	129
			1191	1188	1045
	Sample B				
	Ashmont Secondary School Ashmont, Alberta D. Lee	County of St. Paul #19			75
	Cayley School Cayley, Alberta B. Akitt	Foothills School Division #38	12		
3.	Donnan J.H. School 7803-82 Street Edmonton, Alberta H. Johnson	Edmonton Public School District #7	41	89	83
4.	Leduc J.H. School Leduc, Alberta N. Majeski	County of Leduc #25	150	200	200
5.	Louis St. Laurent J.H. 114 St. & 43 Ave. Edmonton, Alberta E. Hummel	Edmonton Separate School District #7	200	200	200
6.	Mecca Glen School R.R. 1 Ponoka, Alberta G. Olsen	County of Ponoka #3			21
7.	Mt. Royal J.H. School 2234 14 St. S.E. Calgary, Alberta B. McConnel	Calgary School District #19	68	76	
8.	Parkview J.H. School 14313-92 Avenue Edmonton, Alberta A. Brattberg	Edmonton Public School District #7	136	159	133
9.	Racette J.H. School Box 1300 St. Paul, Alberta F. Oullette	St. Paul School District #19		130	135

			Pilot Students		
	School and Contact Person	*System*	*Grade 7*	*Grade 8*	*Grade 9*
10.	Rimbey High School Rimbey, Alberta M. Troitsky	County of Ponoka #3	73		
11.	St. Margaret J.H. School 3320 Carol Dr. N.W. Calgary, Alberta J. Martha	Calgary R.C.S.S.D.#1	120	90	90
12.	Sir George Simpson J.H. 50 Grosvenor Blvd. St. Albert, Alberta D. Christensen	St. Albert Protestant Separate School District #1	190	190	185
			990	1134	1122

Sample C

1.	County Central High Vulcan, Alberta Mrs. E. Bucholts	County of Vulcan #2	54	39	
2.	D.S. Mackenzie J.H. 4020-106 Street Edmonton, Alberta R. Krawchuk	Edmonton Public School District #7	252	209	183
3.	Fairview J.H. School 7840 Fairmount Dr. S.E. Calgary, Alberta Mrs. R. Park	Calgary School District #19	240	180	200
4.	F.G. Miller J.H. School Elk Point, Alberta R. Hellquist	County of St. Paul #19		45	48
5.	F.R. Haythorne J.H. Box 5130 Sherwood Park, Alberta L. Gilewich	County of Strathcona #20	180	240	210
6.	Ft. Saskatchewan J.H. Box 3030 Ft. Saskatchewan, Alberta N. Hughes	County of Strathcona #20	100	170	170
7.	Glen Avon School Box 1433 St. Paul, Alberta L. Smith	Glen Avon Protestant School District #5			49
	Ian Bazalgette 3909-26 Ave. S.E. Calgary, Alberta K. Rundquist	Calgary School District #19	180	85	110

School and Contact Person	System	Pilot Students Grade 7	Grade 8	Grade 9
9. Spruce Grove Sec. School Spruce Grove, Alberta N. Smith	County of Parkland #31			160
10. St. Edmund J.H. School 11712-130 Avenue Edmonton, Alberta L. Pirzek	Edmonton Separate School District #7	90	90	90
11. Wellington J.H. School 13160-127 Street Edmonton, Alberta J. Fabian	Edmonton Public School District #7	60	60	60
12. West Park J.H. School 3310-55 Avenue Red Deer, Alberta G. Grivan	Red Deer School District #104*	109		
		1265	1118	1280

	PILOT STUDENTS Level 7	Level 8	Level 9	TOTAL
Sample A	1191	1188	1045	3424
Sample B	990	1134	1122	3246
Sample C	1265	1118	1280	3663
Total Pilot Students	3446	3440	3447	11,333

* The following Red Deer School District #104 schools submitted pilot data but did not participate in the pilot examinations as they are semestered:

1. Eastview Junior High School 3929-40 Avenue Red Deer, Alberta C. E. Hansen	120 - Grade 8
2. Central Junior High School 5121-48 Avenue Red Deer, Alberta B. Stonell	90 - Grade 9

APPENDIX C

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

PILOT TEACHER QUESTIONNAIRE

PART A - Teacher's Background

1. Size of school in terms of school enrollment is. (Check one)

   ☐ a) less than 150 students
   ☐ b) between 150 and 250 students
   ☐ c) more than 250 students
   ☐ d) 250 - 500 students
   ☐ e) 500 - 1000 students

2. The enrollment in my mathematics class is. (If you teach more than one class in mathematics use the average for the purpose of this questionnaire.) (Check one)

   ☐ a) under 15
   ☐ b) 15 - 20
   ☐ c) 21 - 25
   ☐ d) 26 - 30
   ☐ e) more than 30

3. For the purpose of maximum student learning using the Consortium's Junior High Mathematics Program the enrollment in mathematics classes should be. (Check one)

   ☐ a) under 15
   ☐ b) 15 - 20
   ☐ c) 21 - 25
   ☐ d) 26 - 30
   ☐ e) more than 30

THE QUESTIONS IN THIS SECTION DEAL WITH YOUR EXPERIENCE AND PROFESSIONAL BACKGROUND.

4. How many years of teaching experience do you have at the Junior High School level? (ie. grade 7, 8, 9?) (Do not include the present school year.) (Check one)

   ☐ a) no experience
   ☐ b) 1 year
   ☐ c) 2 years
   ☐ d) 3 years
   ☐ e) more than 3 years

5. How many years of teaching experience do you have in Junior High Mathematics? (Do not include the present school year.) (Check one)

   ☐ a) no experience
   ☐ b) 1 year
   ☐ c) 2 years
   ☐ d) 3 years
   ☐ e) more than 3 years

PART A - Teacher's Background (Continued)

6. The number of university mathematics courses I have taken is. (Include Statistics and Computing Science.) (Check one)

   ( ) a) none
   ( ) b) 1 - 3 course(s)
   ( ) c) 4 - 6 courses
   ( ) d) 7 - 9 courses
   ( ) e) more than 9

7. The number of curriculum and instruction (Methods) courses in mathematics that you have taken is. (Check one)

   ( ) a) none
   ( ) b) 1/2 - 1 course
   ( ) c) 1 1/2 - 2 courses
   ( ) d) 2 1/2 - 3 courses
   ( ) e) more than 3 courses

8. In terms of training, how well are you prepared to teach mathematics? (Check one)

   ( ) a) extremely well
   ( ) b) very well
   ( ) c) adequately
   ( ) d) poorly
   ( ) e) very poorly

9. The decision for you to teach mathematics was made. (Check one)

   ( ) a) on the basis of training in mathematics
   ( ) b) on volunteer basis
   ( ) c) on the basis of teaching experience
   ( ) d) by the principal
   ( ) e) other, explain ______________________________

10. In general, how satisfied are you with teaching mathematics? (Check one)

   ( ) a) very satisfied
   ( ) b) generally satisfied
   ( ) c) undecided
   ( ) d) somewhat dissatisfied
   ( ) e) very dissatisfied

11. Lesson preparation and planning in mathematics requires: (Check one)

   ( ) a) more time than in any other subject
   ( ) b) same amount as any other subject
   ( ) c) less amount of time than any other subject

12. The development of a curriculum for mathematics is. (Check one)

   ( ) a) a very easy task
   ( ) b) no more difficult than planning for other subjects
   ( ) c) more difficult than other subjects
   ( ) d) a very difficult task
   ( ) e) beyond my ability

PART A - Teacher's Background (Continued)

13. In my mathematics program I am able to provide for the needs, interests and abilities of. (Check one)

( ) a) all students
( ) b) most students
( ) c) some students
( ) d) very few students

14. Grouping of students in my mathematics classes is. (Check one)

( ) a) homogeneous with respect to mathematical ability
( ) b) heterogeneous with respect to mathematical ability
( ) c) others (specify) ______________________________

15. Grouping of students in mathematics should be. (Check one)

( ) a) homogeneous with respect to mathematical ability
( ) b) heterogeneous with respect to mathematical ability
( ) c) others (specify) ______________________________

16. To what extent do students contribute to the selection of curricular content in mathematics. (Check one)

( ) a) to a great extent
( ) b) to some extent
( ) c) to a very little extent
( ) d) not at all

17. What are we trying to do in the Consortium's Junior High Mathematics program seems clear to me. (Check one)

( ) a) strongly agree
( ) b) agree
( ) c) undecided
( ) d) disagree
( ) e) strongly disagree

18. I feel the Consortium's Junior High Mathematics program should be: (Check one)

( ) a) continued to be offered
( ) b) continued but modified
( ) c) discontinued

If you choose (b) how do you wish it to be modified ____________________

____

PART A - Teacher's Background (Continued)

19. To what extent should mathematics be structured? (Check one)

☐ a) completely structured by the Department of Education
☐ b) about one half structured and the other half developed by the teacher
☐ c) unstructured, but with more assistance in terms of suggestions and ideas from the Department of Education
☐ d) completely unstructured
☐ e) because of the way it is operating, a total revision should be made
☐ f) other (specify) ______________________________

____

PART B

THE QUESTIONS IN THIS SECTION FOCUS ON TIME ALLOCATION AND THE LENGTH OF THE PROGRAM OFFERING.

1. The total time of instruction per week for my mathematics class is approximately: (Select the answer that is closest to your situation.) (Check one)

☐ a) Four 40 minute periods per week
☐ b) Five 40 minute periods per week
☐ c) Six 40 minute periods per week
☐ d) Seven 40 minute periods per week
☐ e) Other (explain) ______________________________

____

2. The present time allotment per week for my mathematics class is: (Check one)

☐ a) too much
☐ b) sufficient
☐ c) not enough

3. The mathematics program at our school at the present time is: (Check one)

☐ a) a full year course
☐ b) semestered
☐ c) trimestered
☐ d) other (explain) ______________________________

____

4. The mathematics program should be offered as: (Check one)

☐ a) a full year course

☐ b) semestered course

☐ c) trimestered course

☐ d) other (explain) ______________________________

____

APPENDIX D

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

PILOT TEACHER UNIT INTERVIEW

Unit ________ Level __________ Interview ________

Date Started ___________ Date Completed _______________

PART 1 - Use of the Unit

1. a) To what extent did you find the objectives suitable for the students you are currently teaching in each of the following groups:

    i) gifted students

    very suitable suitable not suitable

    Identify the ones that are not suitable and give your reasons why.

    ____

    ii) average student

    very suitable suitable not suitable

    Identify the ones that are not suitable and give your reasons why.

    ____

    iii) slow learners

    very suitable suitable not suitable

    Identify the ones that are not suitable and give your reasons why.

    ____

   b) To what extent were the students you are currently teaching able to achieve the objectives in each of the following groups:

    i) gifted students

    great extent some extent not achieved

    Suggested improvements ____________________________

    ____

    ____

    ii) average students

    great extent some extent not achieved

    Suggested improvements ____________________________

    ____

    iii) slow learners

    great extent some extent not achieved

    Suggested improvements ____________________________

    ____

    ____

PART 1 - Use of the Unit (Continued)

2. In this unit which of the following did you use?

a) Prescription sheets Yes No

If not, why not?

b) Suggested activities Yes No

If not, why not?

c) Learning package Yes No

If not, why not?

3. Regarding the prescription sheets

a) Did you use the sequence of objectives as given? Yes No

If not, why not?

Suggested improvements

b) To what extent did you find the referencing to be adequate?

entirely adequate somewhat adequate not adequate

Suggested improvements

c) To what extent did you find the coding of the text book exercises to be suitable?

very suitable somewhat suitable not suitable

Suggested improvements

PART 1 - Use of the Unit (Continued)

3. Continued

d) To what extent did you find the teacher's notes to be of assistance?

great value some value no value

Suggested improvements ______________________________

4. a) Regarding the suggested activities, indicate the purposes which you used them: (please check)

i) As post lesson reinforcement ________

ii) As post unit review ________

iii) As general maintenance of skils ________

iv) As enrichment material ________

v) As motivational material ________

vi) Other ________

b) To what extent did you find these suitable for the purpose used?

very suitable somewhat suitable not suitable

Suggested improvements ______________________________

5. Regarding the Learning Package

a) Did you use the sequence of objectives as given? Yes No

If not, why not? ______________________________

b) To what extent:

i) Did you use the Suggested Development?

great extent limited extent not used

Suggested improvements ______________________________

ii) Did you find the Suggested Develoopments to be adequate?

great extent limited extent not adequate

Suggested improvements ______________________________

PART 1 - Use of the Unit (Continued)

5. Continued

b) iii) Did you use the exercises?

great extent limited extent not used

iv) Did you find the exercises to be adequate in meeting the objectives?

great extent limited extent not adequate

Suggested improvements ______________________________

____

____

v) Would a coding of exercises such as enrichment, maintenance and introductory be of assistance?

great assistance some assistance no assistance

Suggested improvements ______________________________

____

____

c) How did you use the maintenance objective exercises?

i) In a block as general review ______

ii) In part as specific review ______

iii) Other ______________________________

Suggested improvements ______________________________

____

____

PART 11 - Unit Booklet

Please comment regarding:

1. Organization (format) of the booklet.

____

2. Printing of the booklet (legibility, ease of reproduction, etc.)

____

3. Diagrams (accuracy, size, legibility, etc.)

____

4. Keys (useful, accurate)

____

PART 111 - General Comments

1. Do you consider the unit to have some strong points?

( ) yes ( ) no

If yes, please list the three that you considered to be the strongest.

(a) ____________________

(b) ____________________

(c) ____________________

2. Do you consider the unit to have some weak points?

( ) yes ( ) no

(a) ____________________

(b) ____________________

(c) ____________________

APPENDIX E

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

PILOT TEACHER END OF YEAR INTERVIEW

PART A

Please indicate your position with regards to each of the following statements.
NOTE: Program refers to the Consortium's Junior High Mathematics Program.

1. To what extent did you find the program to be of assistance in unit planning?

great value   some value   little value   no value   no opinion

2. To what extent did you find the program to be of assistance in daily planning?

great value   some value   little value   no value   no opinion

3. To what extent did you find the program to be of assistance in

a) test construction?

great value   some value   little value   no value   no opinion

b) student evaluation (ie. report card)

great value   some value   little value   no value   no opinion

4. To what extent did you find the program to be self-contained with a minimum of external resource necessary?

completely   mostly   somewhat   not-at-all   no opinion

5. To what extent did you find the program changed your workload?

great increase   some increase   no change   some decrease   great decrease

6. To what extent did you find the program to provide for alternate teaching strategies?

great extent   some extent   limited extent   no extent   no opinion

7. To what extent did you find the program to be of interest to the

a) gifted students?

great interest   some interest   limited interest   no interest   no opinion

b) average students?

great interest   some interest   limited interest   no interest   no opinion

c) slow learners?

great interest   some interest   limited interest   no interest

8. To what extent did you find the program to motivate the

a) gifted students?

great motivation   some motivation   limited motivation   no motivation
no opinion

b) average students?

great motivation   some motivation   limited motivation   no motivation
no opinion

c) slow learners

great motivation   some motivation   limited motivation   no motivation
no opinion

PART A - Continued

9. To what extent did you find the program interesting to teach?

great extent   some extent   limited extent   no interest   no opinion

IMPLEMENTATION AND REVISION OF JUNIOR HIGH MATHEMATICS CURRICULUM MATERIALS

COURSE OBJECTIVE PERFORMANCE CRITERIA (RATING)

1. Rating Criteria

Each objective was assigned a rating on the following basis:

a) Objectives Rated One

- Mastery is essential to further progress
- Essential to attain for every child
- Overlearning is recommended

b) Objectives Rated Two

- Highly important skills
- Prerequisite skills to further work
- Most students should master skills

c) Objectives Rated Three

- Desirable skills
- Important to attain for academic students
- Less important for non-academic students

d) Objectives Rated Four

- Enrichment or interest only topics
- Isolated topics
- Not prerequisite skills

e) Maintenance Objectives

- Maintenance objectives have not been rated as they contain more than one skill, each of which has been rated at a previous level.

2. Objective Ratings

Tables F(i), F(ii) and F(iii) list the objective ratings for the course for levels seven, eight and nine as set after review by the appropriateness committee. Changes in the rating of an objective from that set by the performance criteria committee have been noted.

TABLE F(i)

RATING OF LEVEL SEVEN OBJECTIVES

UNIT		MAINTENANCE OBJECTIVES	OBJECTIVES RATED ONE	CHANGES FROM ORIGINAL RATING	OBJECTIVES RATED TWO	CHANGES FROM ORIGINAL RATING	OBJECTIVES RATED THREE	CHANGES FROM ORIGINAL RATING	OBJECTIVES RATED FOUR	CHANGES FROM ORIGINAL RATING
Set Theory									1,2,3,4,5, 6,7,8	
Whole Numbers			5,6,7,8,11, 12,14,15a, 15b, 15c, 15d	15c and 15d from three	3,4		9,10,13,16, 17, 18		1,2	1 from three
Rational Numbers	A	1					2,3		4,5,6	
	B	1	3,6,10,11, 12,15		5,7,9,16	5 from three	13		2,4,8,14	14 from three
	C	1	4,5,6,8,9, 12,13,15		2,3,14a,14b 14c,14d		7,10,11,16, 17,18			
Rate, Ratio & Percent		1	2,3				4		5,6,7,8, 9,10	
Measurement			3,4,5,6				1,2,7,8,9		10	
Exponents									1,2,3	
Geometry		1	2,17,19, 21		18		3,4,6,7,8, 10,11,12, 13,15,16		5,9,14 23,24	

TABLE F(ii)

RATING OF LEVEL EIGHT OBJECTIVES

UNIT	MAINTENANCE OBJECTIVES	OBJECTIVES RATED ONE	CHANGES FROM ORIGINAL RATING	OBJECTIVES RATED TWO	CHANGES FROM ORIGINAL RATING	OBJECTIVES RATED THREE	CHANGES FROM ORIGINAL RATING	OBJECTIVES RATED FOUR	CHANGES FROM ORIGINAL RATING
Set Theory	1							2,3	
Measurement A	1								
B		2		1		3,4,5			
C				2		1,3			
Geometry	1	5(ii), 7,8, 9,11,19		15,17,18, 20,26,29		2,3,4,6,12, 13,14,21, 22,23,24, 27,28,31		5(i),10,16, 25,30,32, 33	5(i) from three
Rational Numbers A	1	5,6,7,8, 9,11				4,10		2,3,12	
B	1	5,6,7,8, 9,10,11, 16,18a, 18b,19		14,18c,18d, 18e,23		3,12,13,15, 17,18f,21, 22	22 from two	2,4,18g, 18h,20	
Rate, Ratio & Percent	1			2,3,4,5, 6,7					
Exponents		1,3		6a,6b	6a from one, 6b from one	2,4,5,6c, 6d,9		7,8,10, 11,12	

TABLE F(iii)

RATING OF LEVEL NINE OBJECTIVES

UNIT	MAINTENANCE OBJECTIVES	OBJECTIVES RATED ONE	CHANGES FROM ORIGINAL RAING	OBJECTIVES RATED TWO	CHANGES FROM ORIGINAL RATING	OBJECTIVES RATED THREE	CHANGES FROM ORIGINAL RATING	OBJECTIVES RATED FOUR	CHANGES FROM ORIGINAL RATING
Rational Numbers	1	3a,3b,3c, 3d,3e,3f		7a		3g,5,6		2,3h,3i,3j 3k,3l,4,7b	7b from three
Geometry	1,2					3,4,5,6,8, 10,11,12,13, 14,15,16,19, 20,21,22		7,9,17,18, 23,24,25, 26,27	
Exponents	1					2a,2b,2c,2d, 3		4,5,6,7	
Algebra				1	1 from one	2,3,4,5,6,7, 8,9,10,11, 12,13,15,16, 17,20		14,18,19,21, 22,23,24,25, 26,27,28	
Coordinate Plane						1,2		3	
Real Numbers								1,2,3,4,5	